TIMBER OWNERSHIP AND LUMBER PRODUCTION IN THE DOUGLAS FIR REGION

BY

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PREFATORY NOTE

This report results from 16 months' local study by the writer, aided by numerous members of the Forest Service, utilizing also data previously gathered by that organization and by the U. S. Bureau of Corporations. Ready and effective cooperation was had from lumbermen of the region.

The occasion for the work was the existence of depression in the lumber industry, wide-reaching but known to be especially acute in the region producing Douglas fir, and its practical bearing upon forest conservation. More than temporary causes were believed to be behind this, hence the desirability of even partial relief would be the greater. Further than that, the industry was advocating or complaining of public action in respect to taxation, shipping, foreign competition and foreign trade, and the management of timber publicly owned.

The public too, has been more or less concerned over several matters embraced in the broad field. Among the topics of interest to it, aside from the prosperity and welfare of one constituent region of the United States, are the following:

1. The sufficiency of the timber supplies in this great timber region; their utilization, protection and renewal; and sound public policy in regard to the export of lumber.

2. Are the operations of the lumber industry reasonably economical and efficient, or are consumers paying the cost of inefficient work? Are changes in organization, particularly larger scale work, desirable or to be expected?

3. Is there a lumber trust, or does any serious threat to the general interest exist from concentrated ownership of timber or otherwise?

4. How, in relation to the lumber industry, should the National Forests be administered? What line of action in the broad field of timber supply, present and future, does enlightened and progressive public forest policy call for?

The work here presented does not lay claim to being exhaustive, for the field is very wide and the elements in it more diverse than could be imagined by anyone not familiar with it. Balance and soundness of view, however, have been sought through acquaintance with the personal elements in the case.

Some main conclusions are indicated as follows:

1. The timber stock of the region is enormous, believed to represent 130 years' supply at the present rate of cut; it appears therefore, that realization on its timber resource as fast as economic conditions dictate need not be begrudged to the industry or region.

This timber stock is being protected from destruction by fire with a very good degree of efficiency, and where that protection is continued natural renewal is liberal and growth very rapid. While standards of utilization for the most part

are all that economic conditions justify, from the ideal viewpoint they are low yet, while a material waste of timber would accompany continued production under the conditions existing in 1914 and 1915. In respect to all these matters improvement is to be expected in the natural course of affairs.

2. There is wide range in the efficiency of lumber operations as now conducted. The recent period of depression by weeding out the weak and inefficient raised the general level as similar periods have done in the region before.

The size of units of production is now increasing under the play of natural forces: It is not clear to what length that movement may soundly and desirably go, but certain on the other hand that small mills in numbers will always exist and that ultimately return will be made to small units of lumber production.

3. It is shown that past returns to the producing industry could be called excessive only for short periods, and that they have been very moderate for eight years past.

4. Competition is in force in the industry, in fact is severe to the point of damage at times, although lumbermen are in free communication with one another and often handle market situations on a common policy basis on information collectively obtained. A degree of cooperation is inevitable, however; it is shown to have brought benefits in the past, and ways are pointed out in which it may in future produce results of great value to all concerned. Sounder and stronger

business leading to greater stability is developed as the chief need of the local industry, this for the sake of every legitimate interest involved - regional prosperity, labor's welfare, advantageous utilization of the natural resource, and the benefit of the consuming public. To bring this about some changes in sentiment and method on the part of the industry are required, with a corresponding and helpful attitude on the part of the public. These given, the undoubted difficulties of the case should be in considerable degree surmounted whether methods of fostering and regulating business now foreign to this country are adopted or not.

6. Substantial needs of the industry are involved at several points in ways which can be met only by public policy or law. An unnatural advantage held by British Columbia in our own East Coast markets is the most pressing of these. Then the industry asks that its interests be considered in the sale of public timber, while a section of it is desirous of legal permission to put up a more united front in the export trade. Moderate and dependable taxation of timber lands is a matter vital to its future.

7. Part II deals with the vital matter of timber ownership, a subject exceedingly complex and admittedly difficult. An assembling of the basic facts, only recently become available, throws light on the shrinkage in valuation that has recently taken place and indicates lines of more stable adjustment. Among other things the necessity of financing

a timber reserve is shown, indicating the desirability of strong, permanent ownership, while the opportunity is pointed out for expanding public forest policy.

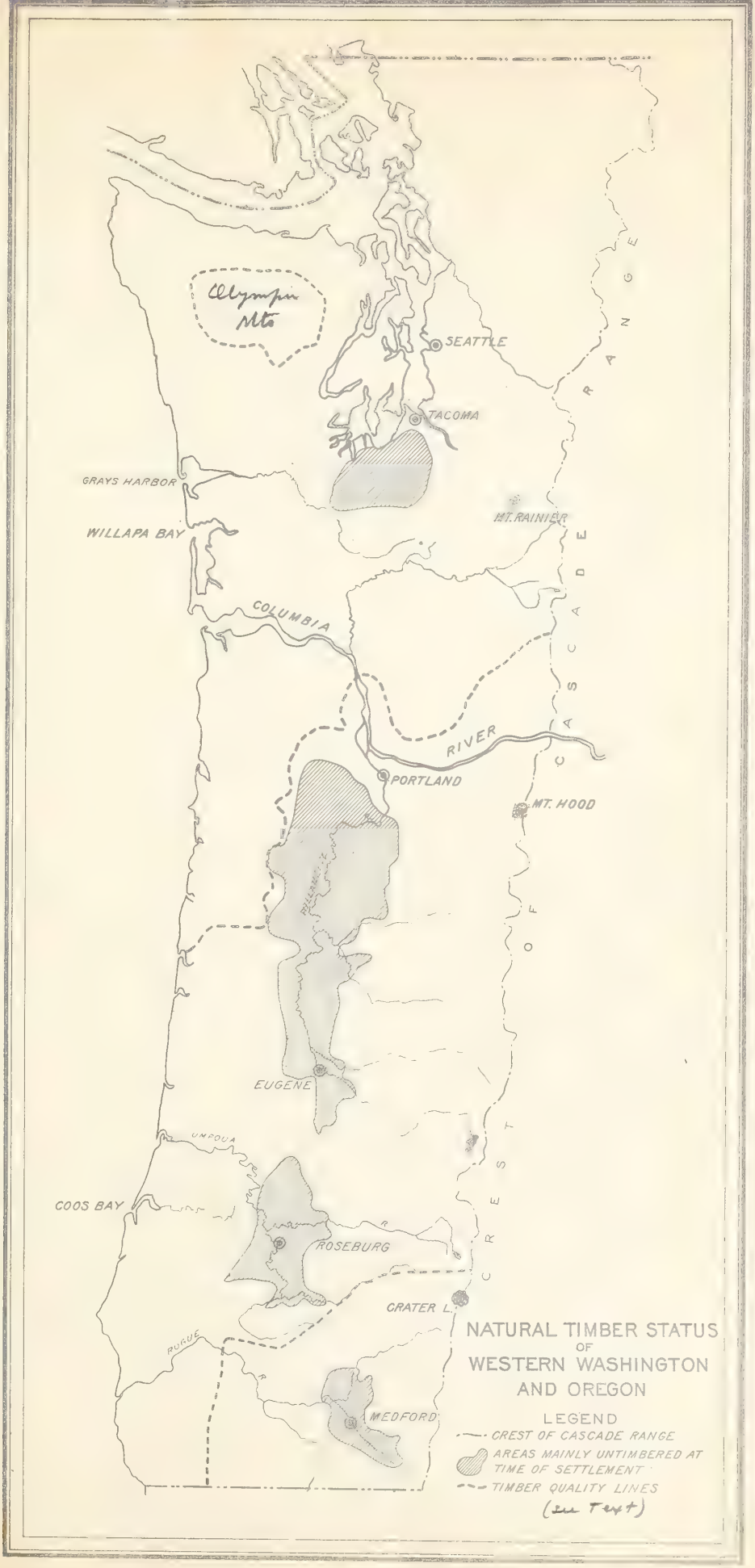
PART I. - INTRODUCTION

Section 1. Descriptive and Statistical

The forests of western Oregon and Washington are world-famous for their extent and quality. Taken together with those of Vancouver Island and a strip of land of limited width lying opposite, across Puget Sound, they contain in fact the finest body of general purpose timber known to exist on the face of the earth.

This timber belt north and south through Oregon and Washington is very close to 500 miles long. Its width, between the Pacific Ocean and the crest of the Cascade Mountains, at the south, through much of Oregon, is about 110 miles; but it spreads out northward, to 170 miles across the upper end of the Olympic Peninsula. The portion north of that latitude, between the mountain crest and Puget Sound, has a width of 70 miles. These dimensions give a land area of about 54,000 square miles, an area greater than that of the New England States with New Jersey added, or about equal to either Alabama or Iowa.

With the exception of possibly 7% of its area in water, bare mountain tops, and stunted bordering growth, this whole country is potential timber land. The rainfall is abundant except for limited areas at the south end, and there is abundant soil of one kind or another even in areas of rough


Olympic Mts
SEATTLE
TACOMA
GRAYS HARBOR
WILLAPA BAY
MT. RAINIER
COLUMBIA
RIVER
PORTLAND
MT. HOOD
EUGENE
UMPQUA
COOS BAY
ROSEBURG
CRATER L.
ROGUE
MEDFORD
CREST OF CASCADE RANGE
NATURAL TIMBER STATUS
OF
WESTERN WASHINGTON
AND OREGON
LEGEND
CREST OF CASCADE RANGE
AREAS MAINLY UNTIMBERED AT TIME OF SETTLEMENT
TIMBER QUALITY LINES
(see Text)

topography. These natural factors, combined with equability of temperature and a long growing season, produced a native forest of wonderful development. The trees are double the dimensions of related species in the eastern States, and their volume and the stand per acre several times as large.

Not all this area, however, was timbered when white men took possession. Fire, wind and insects occasionally level portions of every native forest; then the native Indians found it desirable, even necessary for their existence, to keep open a share of its area, in the valley floors chiefly, by means of fires set intentionally.

Lumbering fairly attacked this region in 1850 on the shores of its magnificent harbors, the rapid growth of population in California after the gold discovery furnishing both stimulus and direction. In the year named and those just succeeding, several sawmills were built on Puget Sound and the lower Columbia River - steam mills, located with reference to water shipment. Twenty to thirty years later the business extended to the great harbors on the west coast of Washington. In that form, tidewater mills shipping by vessel to California and certain foreign countries, the industry, except for the small interior output required for local use, remained until the advent of railroads.

The railroad system of the region, beginning in 1883 with completion of the Line down the Columbia River, completed in outline ten years later, but growing and extending its network down to the present day, opened new markets and a new line of development for the lumber industry. Much timber bordered the main lines, while from them laterals have been run into the mountain valleys or to coast points. Of the new opportunities thus given, lumbering took prompt advantage, at one time or another making at least a start in every portion of the region. At the same time mill capacity on tidewater increased, the two keeping pace with the growth of markets. To-day lumbering is by far the leading manufacture of the two States, producing values equal to their agriculture. More than 100,000 wage earners are engaged in it, over half the total number employed. For wages and salaries, according to the last Census, more than $80,000,000 is yearly paid out. When their lumber industry is not thriving, Oregon and Washington are ill at ease.

Following is an assembling of statistical data on the area, timber resources, etc., of the Douglas fir region. Natural status is first covered; next the status to-day.

In the region as a whole there may have been utilized to date 120 billion feet of lumber, cut from something like 4,000,000 acres.

Natural Status

Area west of the Cascade Mts. in Washington,	24,684 sq. mi.
Area west of the Cascade Mts. in Oregon,	29,453 " "
Together,	54,137 " "
Area permanently unproductive (water, bare rock, scrub timber), about	3,700 " "
Area of prairie land at time of settlement (mainly in Oregon),	4,300 " "

Land in Washington capable of agriculture or grazing (U.S. Bureau of Corporations)	60%
Tillable land in Oregon (Oregon Almanac)	33 1/3%

Status 1914-15

	Washington	Oregon	Together
Population (Census of 1910)	732,291	530,000	1,262,291
	Acres	Acres	Acres
Area - Gross less permanently unproductive,	14,000,000	18,200,000	32,200,000
" Cultivated (Census 1910)	550,000	1,600,000	2,150,000
" Timbered lands privately owned (State officers)	3,791,000	5,200,000	8,991,000
" Timbered lands state owned (State foresters)	536,000	14,000	550,000
" Timbered lands in National Parks, Indian and Military Res. and on public lands,	350,000	100,000	450,000

	Washington Acres	Oregon Acres	Together Acres
Area -Timbered lands in National Forests (over 80 yrs.)	2,575,000	3,555,000	6,130,000
" Timbered lands in litigation		1,700,000	1,700,000
" Balance of acreage,	6,200,000	6,031,000	12,231,000
" Net area of Nat. Forests	4,982,000	5,834,000	10,816,000
	M. Feet	M. Feet	M. Feet
Timber on private lands (U.S.Bureau of Cor.Jan.1,1911 less 4 year's cut)	255,000,000	270,000,000	525,000,000
" on State lands (State Land Commissioner)	37,000,000	?	?
" in Nat. Forests (over 80 yrs. of age)	72,000,000	90,000,000	162,000,000
" in Nat. Parks and Indian Res. and on open public lands	8,000,000	10,000,000	18,000,000
Total timber	372,000,000	420,000,000	792,000,000
Annual cut about	4,000,000	2,000,000	6,000,000

Note. The above estimates of timber quantity require interpretation, as follows:

a. Estimates of privately owned timber current in Oregon and Washington, 1914-15, based in part on more accurate cruises and better knowledge of area than were available in 1909, are less than those of the Bureau of Corporations by about 30%. These estimates, however, are based on log scale, not lumber product as were those of the Bureau, and they omit from consideration small, scattered, and distant timber not merchantable under the standards of to-day. Timber men, however, are almost uniformly of opinion that the figures of the Bureau are too high.

b. The estimates for the National Forests are the latest, dating with the year 1914. These are on a different basis than commercial estimates, timber being counted in regardless of density or situation. The cruising behind these figures is only in part of an intensive and accurate character. The timber on the National Forests averages much less accessible and of lower grade than privately owned timber.

c. Timber areas and quantities on state lands, military reservations and open public lands are not accurately known.

d. All estimates except those of the Bureau of Corporations are on a log scale basis, not that of sawnproducts, the difference between the two being 10-15 percent commonly in the practice of to-day. Since, however, estimates on such a large scale could not claim accuracy within rather wide limits, because

also the estimate of the Bureau of Corporations as noted above, may be too high, it is felt that the foregoing total figures may represent as nearly as any the resources of the region in terms of manufactured lumber. These may, indeed, before this timber is cut, be raised to a marked degree by changing standards of utilization.

e. Of the total timber stand of the region, 70 percent is estimated to be Douglas fir; hemlock 11 percent; spruce 8, leaving 11 percent for the minor species together.

Section 2. Timber Kinds, Distribution and Quality

Species and Quality

The whole of the west side of Washington and Oregon has been spoken of as potential timber land and the greater part of it as actually timbered at the time of white occupation, while with all the cutting and settlement that have taken place and the looseness about fire that long held, about two-thirds of the gross area is timbered to-day. Of this timber there are a number of kinds and a wide range in stand and in quality commercially considered. This fact has strongly directed development in the past, and to-day affects heavily availability and commercial value.

First is the specific difference among the trees that make up the natural forest. Douglas fir, the most generally distributed and at the same time the finest in general

also the estimate of the Bureau of Corporations as noted above may be too high. It is felt that the foregoing total figures may be considered as nearly as may the resources of the region in terms of industrial timber. There may, indeed, before this cited is out, be found a sufficient margin by changing standards of utilization.

5. Of the total timber stand of the region, 70 percent is included in the Douglas fir, leaving 11 percent spruce and hardwood to account for the other species.

Section 3. Timber Trade, Distribution and Demand

Market and Quality

The value of the west area of Washington and Oregon has been spoken of as potential timber land and the growing part of it as actually immersed in the lumber or pulp manufacture. While very all the existing and estimated that part of these lands the Douglas-fir also has been here, there is ample of the upper area in Hardwood Lumber. It has already been a number of kinds and a wide range in stand and quality geographically considered. This fact has brought large employment in the past, and to-day affects heavily availability and commercial value.

Fact is the available difference among the trees that make up the natural forest. Douglas fir, the most widely distributed and at the same time the finest in quality

timber quality, was the first to be utilized. It was early shipped to different parts of the world for masts and spars, and was the first to be manufactured on a large scale into lumber. The most characteristic products of this tree are large timbers. Of these a stick 18 inches square and 154 feet in length sawed for the Alaska-Yukon-Pacific Exposition is stated to be the longest ever sawed in a mill. The keel of a vessel recently laid contained a stick 24" x 24" x 140' and cross-sections as large and larger on shorter lengths are matters of frequent production. But finished products as well are produced, in variety adapted to most purposes.

Other species were later in attaining commercial value. Spruce lumber, it is true, has long had a place as a standard product of the region. About 30 years ago cedar came to be employed on a considerable scale for the manufacture of shingles.

Two other species have fine development and great utility. Noble fir, frequently called larch in commerce, being a mountain tree has only within a few years and at a few points been reached as a matter of practical logging. Hemlock up to the present has been rather hard to dispose of, but is now receiving wider appreciation, especially in the East Coast markets now reached by water. The white firs reach a size similar to the other species, occur in considerable quantities, in the mountains mainly, and are not now prized

as lumber simply because there is such a wealth of material which in most respects is more desirable.

Less generally understood than specific differences is the matter of timber quality. To the unitiated, lumber is lumber, a staple article of considerable value, and a similar idea attaches to the timber from which it is produced. Locally, however, conditions are in fact otherwise. Lumber suitable for ordinary purposes of construction is very abundant, of low price, and timber that will produce it has value to cut only in favorable locations and conditions of the market. Commercial value depends, therefore, not only on location, but very largely on quality as well.

High quality consists in the first place of freedom from knots that mar the appearance and lessen the strength of lumber. It is found in the outer and lower parts of trees that represent the growth of centuries, and goes along also with the fine grain characteristic of that method of formation. Timber growth that is really magnificent in development, that will impress enormously people coming from any other region of the country, because it is not old enough to have cleaned itself in this way, may have little commercial value here.

Defect in Timber.

Quality in the above sense is reasonably evident to those equipped to observe it. There are, however, internal

features of western timber, no less telling in their influence on value, which are obscure. Of these, decay is the one of most general diffusion. This is generally characteristic of stands of very great age, but is widely existent elsewhere, and has to be carefully allowed for by every lumberman; and this, because external signs are so small and so difficult of observation, is a delicate task for the most experienced. By way of illustration it may be mentioned that two Forest Service lumbermen recently tallied 30 percent of the trees in a valley on the Cascade National Forest as "conky," and estimated the amount of defect in the whole stand as 20 percent of its total apparent contents. Occasional bodies of timber in that region and elsewhere are so defective - in fact believed to carry 50 percent defect - that although near to transportation they are not now salable.

Decay, the work of fungi, is the chief form of internal defect in all the Coast timbers. All species are somewhat similarly affected; large cedar so severely that big trees often have but a shell of sound wood which shatters into splinters when they are felled in the course of lumbering. In addition to decay, pitch and shake are of material significance in connection with fir and spruce, lowering the total yield somewhat, but having more commercial effect on the value of the product, throwing down to common use oftentimes at a very cheap price what otherwise might be sold as high-priced lumber. Their distribution varies sharply by locality.

Stand per Acre

A general figure for stand per acre that will hold over large tracts is 50 M feet B.M. 30 M is a small stand, and 200 M is occasionally seen on an acre, both in fir and cedar. Hemlock, with smaller dimensions than the species named, will sometimes yield 10 million to the quarter section, and that is a good yield for timber of any species. 20 million is the extreme for a quarter section of fir.

Distribution of Timber

In the great timber belt of western Oregon and Washington, while there is great local variation, certain broad lines of distribution can also be drawn which will serve to clear the situation. In general, the combination of volume, clearness and soundness which determine the commercial value of timber is highest to the north.

On the map attached are shown two lines representing broadly the facts of forest quality. First is a line cutting off about 3 1/4 million acres of mixed pine and fir at the south end, a forest of great utility indeed, but in which neither kind of timber realizes its finest development. Second, crossing the Columbia River a little below Portland, is a line separating the generally higher grade and more valuable stands from those of lower quality and less value in the region producing fir distinctively. To this general

division there are many exceptions in both directions. In a broad way, however, it holds, and in large part it explains the facts of commercial development. Puget Sound and Columbia River developed their industry first, due both to shipping facilities and to quality of timber; the Washington harbors somewhat later. Washington thus far has cut out a far larger proportion of its natural timber resource than Oregon, and to-day its volume of production is more than twice as large.*

Commercial Varieties of Fir Timber

Something further needs to be said of the varieties of fir timber. Yellow fir is old growth timber that has had time to clean itself of limbs and produce a considerable thickness of clear wood. The trees are generally of large size and the grain is fine and even, due to the conditions of growth. The texture, too, in typical timber is soft and adapted to working. This timber furnishes the finest and most valuable fir products, which come out of the outer parts of the lower logs. The hearts of the same logs and the upper portions of such trees may, however, furnish a very low grade of lumber. This is due, first, to general weakening of the wood through age; second, to large knots that weaken the lumber, and third, to shake and decay. A mill, therefore, that cuts the finest of high-grade lumber may produce but a low quality of common.

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* Much of the timber manufactured at Portland and elsewhere on Columbia River is cut in Washington.

Red fir, though its dimensions may be large, is, on the other hand, a tree much more quickly grown than the other. It will not produce an equal proportion of high-class lumber, nor the quality either, as a rule, of those products. On the other hand, being generally sound, with knots not as large as those of yellow fir, it furnishes excellent timbers and building material. Color, though attached to the variety name, is variable. Other varieties than those named are recognized.

The following facts will serve to illustrate and define the variations in lumber quality and value.

a. Previous to the recent depression, billed-out prices for classes of lumber representative of the cut were about as follows:

Joists and scantlings, serviceable building lumber, produced abundantly from all classes of timber	$10
Low quality of common lumber, containing large knots or other serious defects, requiring to be cut up in order to serve other than very cheap uses.....	$ 6
Clear lumber suitable for fine uses, but as yet unfinished	$22

b. During the same period the billed-out prices of the lumber shipped from a fir mill sawing for the interior trade ranged from about $4 to over $30.

c. The average value of the lumber produced by different mills varied at the same time because of quality by about $5.

Quality in standing fir timber may be broadly characterized as below:

a. The highest percentage of lumber grading "clear" yielded by any considerable body of fir timber logged cleanly and sawed according to present-day standards, is around 40 percent.

b. Thirty percent is high, and timber yielding this proportion may be just as valuable as the other because of the better quality of its common lumber.

c. Fifteen to 20 percent is fair and only to be had from timber 200 years old and upwards.

d. Second growth, at 50 to 80 years of age, cut to some extent now, is sure to be more largely handled in the future. Its quality has a very wide range, but common lumber produced from such stands thickly grown on good soil is good, yielding in fact some material that is adapted to use as car sills and such higher class structural purposes. Railroad ties also are largely produced from it. The question of defect may in this class of timber be very nearly forgotten.

Section 5. Outline of Lumbering History and Achievement

The timber of Columbia River and Puget Sound grew clear to the water's edge and to men as forcible and simply ingenious as those who first undertook its manufacture, the problem of cutting logs and getting them where they were wanted presented no great difficulty. In their mills, whose

machinery was brought around Cape Horn from the east coast, the problem was a little more difficult. There the very size of the logs was a drawback; marked adaptations had to be made to it, and these continue to the present.

Logging

With departure from the mere shore line and failure of the methods of rolling and the jack screw, there arose by reason of the weight of the logs a problem of transportation unlike any met before in the industry. Ox teams were the first device resorted to, and they, facilitated by skids bedded crosswise, with rides cut and greased, for some years served as the answer to the problem. The range of this method of log transportation was approximately half a mile.

As in the eastern country, there was a period in which horses replaced oxen. The reach of this style of haul was greater. Then a Californian, Dolbeer by name, combined an upright boiler, twin pistons and a windlass carrying rope or wire and mounted them on a sort of sled. So equipped, the engine produced was self-propelling and it developed power enough to haul the great logs weighing 10 to 50 tons over the surface of the ground. This device brought to the fir region was soon improved locally by changing the windlass into a horizontal drum, later duplicated to give reverse as well as forward action. Steam power applied through wire was first employed for log transportation on this coast about 1885. Gradually its use extended until, for some years past, it has been the universal method.

The extreme range of this method of log haul may be set at 1,000 feet, 600 to 900 being the common present maximum; again, therefore, it is a means of transportation only for short distances. Suggestion of the double haul was easy, however, and with a chute made of heavy poles fixed in place lengthwise, hewed to a face on the friction side, this method was in fact employed largely, reaching frequently a mile and a quarter. For distant timber, however, rail haul was clearly indicated. This was first tried before 1890 in the region of Olympia. The attempt was successful; the road so located has been used ever since, and is a common carrier to-day.

Such are the broad lines which logging development in the Pacific Northwest has taken up to the present. They look simple, self-evident even, to-day, but clearly it was quite otherwise with the men who step after step solved the problems presented. This meant for them not only the adaptation of mechanical devices to the purpose in hand and the conditions, but the development of organizations to fit and the assumption of the cost and risk involved in trial and experiment. To-day the intelligent visitor from another region can hardly fail to gather from the work an impression of both power and skill - power especially from the course of the great logs as they come in from the stump to the yard, trenching the ground, and tearing up trees that in other sections would be merchantable timber; skill most of all in the layout of the railroads, the planning of engine settings, and the general knitting together

of the work in mountain country. The very size of some present operations constitutes an additional problem.

This past logging development was the work mainly of forcible and ingenious, but untrained men. To-day engineering skill is being applied to the business, machinery builders and actual loggers cooperating. Machinery is being given detailed study and new methods of application devised; gasoline and electricity are being tried as motive power, and for fuel oil is being carefully balanced in cost and efficiency against wood, its habitual source. On the xxxxx side of direct management much of the industry is capable and alert. One of the characteristic institutions of the Pacific Northwest is the Pacific Logging Congress, an organization which meets yearly to discuss like scientists or engineers topics of interest to the profession.

Manufacture

During the sixty years over which the lumber history of the Pacific Northwest is spread, lumber manufacture also has been vastly changed and developed, along the following main lines:

1. The size of plants has increased until the larger mills to-day have six to ten times the capacity of those with which lumbering started.

2. It has been found that the great logs of the region could be worked down into the small sizes desired for ordinary use by a succession of steps, with different equipment in each

case, more cheaply and with greater economy of wood than by one simple process of manufacture. A large modern mill, therefore, is a succession of plants under one roof, and great ingenuity in the adaptation of appliance and its arrangement so as to work smoothly together has been displayed.

3. The early mills put out their lumber in rather large and in simple forms; most of it was shipped green and in the form the saw left it. As the years passed lumber has been worked up into finer forms, very diversified and highly finished in part, necessitating a variety of new equipment.

4. The substitution of power and mechanical devices for labor has been a characteristic feature of the development. Manual labor in a large modern plant is not severe.

At present while there is great variation there exist in this region some of the largest, most complex and most efficient lumber plants in the world.

In General

The above applies to the main current of progress, to lines of improvement worked out by the industry as a whole. There have been eddies in the stream, and of necessity not all the volume got into motion. Taken as a whole, however, progress has been characteristic, and the picture sought to be conveyed, therefore, is of lumber production not as a fixed and determined thing, but as changing and adapting, the work of men who from time to time and at various points have devised new things or

met actual demands and situations. That idea is as true to-day as it ever was. It applies, in fact, more fully than ever before in the sense that it is harder now than formerly to meet the usual standard of achievement. With that also, while granting that the ideal has not yet by any means been reached, it nevertheless is entirely true that with the lapse of time utilization of its natural resource has been brought about that is vastly more economical and diversified than was characteristic of its earlier stages.

The facts cited on page_____, showing at what low figures lumber products have been ordinarily put out from fir mills, illustrate concretely the final results of this process of development. The prices given are in a broad way rather less than half those while equivalent material has brought of late years at wholesale in Boston and New York. Following are illustrations of fine special products put out at a moderate price or of serviceable materials sold at extremely low prices in times of depression.

1. In November, 1914, a lot of 300-400 M feet of prime quality building lumber of random sizes was sold for water shipment to California for $6.50 per M on wharf by one of the strongest concerns on Puget Sound.

2. Low grade lumber suitable for cement forms and other uses was delivered late in 1914 at large buildings in process of construction in the city of Seattle at $5 per M, freight and cartage amounting to $1.50 coming out of that.

3. The segregated costs of a frame house costing $2,490 that was built in the city of Portland in the spring of 1915 showed the cost of lumber delivered, including windows, doors, etc., to be but $450, 18 percent of the whole. The carpenter labor cost nearly as much, and so did the concrete, brick and tile work.

4. Ship decking is one of the characteristic finer products of this region. It is a magnificent clear product, its like to be had only from a few timbers located on widely scattered parts of the earth's surface. Some special difficulties also are involved in its production and treatment. For many years decking has been shipped to England, to Hamburg, to various points within our own country where ships might be building; and in past years before it was pressing systematically for a market, the price had was about $40. Later, however, with stronger competition, $30 to $35 has been considered a normal price. Sales made within the last two years have been at the rate of $25 to $30 per M.

5. The fir door is another characteristic product of fine quality sold in several standard patterns. These doors contain 30 feet of lumber board measure, are constructed at factories by complicated processes, and they have recently sold at 90 cents each on board cars, crated for shipment.

PART II. TIMBER TENURE

INTRODUCTORY STATEMENT

THIS SUBJECT, HOWEVER IN THE PUBLIC EYE OF LATE YEARS, DIFFERENT WAY LOOK AT FROM ENTIRELY DIFFERENT VIEWPOINTS: THE DIVERGENCE IN ILLUSTRATED ON ONE SIDE BY ASSOCIATIONS WITH THE TERM "TI BER BARON," ON THE OTHER BY THE CLAIM OF SOME PERSONS OVERLOOK THEIR LEGITIMATE INTERESTS HAVE SUFFERED AT THE HANDS OF THE PUBLIC. WHATEVER ASPECT OF THE MATTER MAY BE SELECTED, IT WILL BE FOUND SOME INTERESTING DEVELOPED IN THE DOUGLAS FIR REGION THAN ELSEWHERE.

THE FOLLOWING DISCUSSION LEANS IN THE FIRST PLACE TO THE INFERENCE THAT APPREHENSIONS OF DANGER FROM MONOPOLY ARE FOOLIS FOUNDED; ON THE CONTRARY THE ACTUATION OF MANY TIMBER OWNERS, AND TO INCREDULOUS AND CHARGE WHICH THE HOLDING OF SUCH PROPERTY IMPLIES, IS SEEN TO BE FAR FROM ENVIABLE. THEN WITH GATHERED UP THE BASIC FACTS WHICH HAVE ONLY RECENTLY BECOME AVAILABLE, AND POINTS OUT THEIR BEARING.

WITH THE SURFACE THUS CLEARED UP AND OUT ON A BETTER OF FACT BASIS, THE WAY IS OPENED FOR CONSTRUCTIVE CONSIDERATION. LEANS TO WHICH THIS IS APPLIED ARE RELATION, FIRE PROTECTION, THE USE OF LOGGED-OFF LANDS, AND PUBLIC OWNERSHIP OF TIMBER.

Section I.--Historical and Introductory

In a country almost entirely timbered, with lumber its chief commercial product, and the necessity existing of clearing the soil of timber before it could be put to other use, timber facts and timber values of necessity have played a large part in the history of land ownership. Further, a degree of consolidation of ownership is involved because economical lumber operation, by reason of the nature of the operation itself, involves extensive holdings.

With this understood, a related fact is essential, that during the formative years in the history of this region public law did not provide for direct acquisition of timber or timber land in bodies suited to the needs of the lumber industry. The land laws were framed with the idea of dispersing ownership and providing homes for the people, even the great grants to railroads having this disposition in view. When lands were timbered, therefore, the extensive and consolidated ownership impelled by financial interest and the economic advantage just mentioned was brought about by indirect methods. That fraud was often involved in these is well understood, with the attendant conditions; also that the movement was carried to a point which most are now agreed was excessive. Another material point is that first claimants by the facts of the case became timber speculators.

Earlier History

The Pacific Northwest has illustrated more clearly than any other section the workings and results of this system, and that from the beginning of its history. Some of the very early lumbermen of Puget Sound, for instance, were experienced and far-sighted men. They believed in the future of the country, identified themselves with it, and by 1890, after many years of successful operation, had consolidated large land properties, the basis of great fortunes of the present day.

By 1890 the region was cutting 1½ billion feet of lumber annually; between 600,000 and 700,000 people were in the two States, and more people than ever before were interested in lumber and timber in the country at large. Alienation of land was very rapid for three years at that time, and in the succeeding decade several more large properties were amassed in Washington, while in Oregon the same course was begun. Another period of very active land alienation, this time centering in Oregon, followed 1900.

That this land history was directed mainly by timber values, its relation to locality would prove if it were not common knowledge, for it proceeded steadily from accessible and fine quality timber to that less accessible and of lower grade. By the proclamation of National Forests, between 1893 and 1907, alienation of timbered land was largely checked. Consolidation, however, continued longer. This has been extensive, although it is easily

possible to overdraw it. Consolidation involved trading, and the establishment of commercial prices for standing timber on a basis more or less clear, uniform and firm.

All this came about progressively. All through its earlier history the producing lumber industry, that element in the country most interested in timber owning, as far as new enterprises were concerned, was an industry of small units and small capital as well. A claim or two was as much as most new concerns could afford to own. They had to buy their stock of timber or logs from original claim holders, and that affoctimes by the thousand as out. Amassing of timber property and its capitalization had to wait until wealth was produced and realized on. Thus the limited capital in the country for a long time, coupled with the very extent of the resources, were bound to keep valuation low, although difference in quality and accessibility early created for a portion a measable market price.

In the good times about 1890 accessible timber claims for immediate operation are said to have changed hands at prices up to $1 per M, quantity reckoned on the standard of operation of that day. In the dull times of 1894-1897 less accessible claims were brought on a large scale for investment as low as 10 cents per M. A little later the productive business improved and in 1900 50 to 75 cents per M was the going price for claims both around Puget Sound and at Gray's Harbor. In 1904 in interior southern Washington, the best claims, bought to hold, brought

$30,000 and would yield 12 millions, while $1 per M and more was frequently paid in some other sections. Previous to 1900, however, but a minor fraction of the total resource was under ownership, that held at a moderate capital value, and carried for the most part by owners who did not look on their investment in a strict financial way. The sum total of commercial valuation was yet small.

Acceleration after 1900: Boom of 1907

In the year 1900 occurred the most notable commercial event in the timber history of the Pacific Northwest. The Northern Pacific Railway, having parted already with considerable areas of its land grant to root least lumbermen, had reason at this time to realize extensively. A body of 900,000 acres, therefore, stretching across Washington from the mountains west and north to the Columbia River, after being offered to possible investors in different parts of the country, was sold for $5 an acre to Mr. Frederick Weyerhaeuser and associates of St. Paul. This great purchase, followed two and three years later by others much smaller and at a slightly higher price, served to stiffen the stumpage market.

Other influences also came to bear. The next few years were prosperous ones with the productive industry, markets expanding, while increasing prices for lumber were had. Then much new capital realized in the closing out of operations in the Lake States was brought into the country for reinvestment. The conservation movement, also, which was in strong force in this period, accelerated

the movement, the withdrawal of the National Forests, with the agitation as to the sufficiency of timber supplies which accompanies it being widely taken as pointing to high-priced stumpage in the future.

By these agencies the whole range of the timber movement was stimulated. The rush for timber claims was quickened; consolidation went on apace; traders and speculators added the force of their self-interest and ingenuity to the movement; the prices at which timber changed hands rose rapidly. Finally, coincident with great industrial activity all over the country, and emphasized by events which greatly increased demand on the mills, there came the boom of 1906 and 1907, in which lumber prices went up to levels unknown before or since, logs following close in their wake, while stumpage came rapidly after. A period of a year and a half culminating in October 1907 was one of really feverish activity in all branches of the business. Most engaged in it made big money, and fortunes came to those who opportunely sold out, but conservative men would probably agree that the effects on the industry and region in the long run were damaging. In stumpage the effect was remarkable. Sections of land sold at $3, $4 and even $5 per M for quick operation; $2 was reached and passed for tracts of considerable magnitude; the general level of commercial valuation was greatly elevated. Further--and the point is essential--a vastly greater volume of timber than in previous times was involved came under that valuation increase. It seems probable indeed that at the period named commercial valuation of

privately owned timber in the region passed half a billion dollars. Seven years had seen a tremendous transformation in affairs.

Reaction

The phenomena of the recent past are of the nature of reaction. That indeed might be expected after such a striking history, and the Northwest has experienced the same thing in respect to other resources than its timber. The governing factors, of course, are financial mainly. They originate in sources various and widely dispersed and their nature and their application to timber have been clearly thought out by but few. In fact, in the way of their clear understanding some real misapprehensions exist.

The Governing Factors

Of these misapprehensions the first is the prevalent idea that stumpage values must always go up, a rule to be sure which has been growing in history, but to which on the other hand many exceptions might be cited. New transportation has occasionally been the cause of reversals of this rule, and so have waves of general industrial depression. Unsound levels of valuation have been created elsewhere, as for instance, in the State of Maine, whose timber history, though equable in the main, shows two periods of speculation in which large sums were sunk.

Misapprehension arises frequently from applying to all timber ownership commercial rates of interest and strict principles

of finance. In particular, this does not hit the case of the farmer who may own timber--he commonly looks more to security than to profit, and does not reckon with his property on financial principles. Quite generally, too, in his case, and in many sections, the growth of his woodland is a large element in its value and its utility to him. This the owner of a virgin tract cannot look for except in certain cases, for, taken broadly, growth and decay in the virgin forest balance, while occasionally a tract that is overgrown is losing rather than gaining.

Of the owners of timber in a large way operating lumbermen are a dominating class. Their characteristic attitude of late years has been optimism not clearly reasoned, born of temperament and activity largely, based, however, on the general success of timber investments during the last 30 years.

The relation of stumpage value to lumber price is a matter necessary to be understood. The former may be thought of as the latter less all costs of production, and in some circumstances that method of reckoning is safe. In that manner indeed stumpage value must ultimately be realized, but two things are neglected,--first, returns due to operating capital; second, the time element in the case. The financing of the 15 or 20-year supply of raw material frequently thought of as desirably attached to an operating plant is not taken care of--still less that of the 50 to 100 years' supply for an industry such as apparently exists in the mountain and coast states of the Pacific Northwest, two-thirds of which private ownership undertook to carry.

The economics of timber ownership is clearly a complicated matter. Treatment of it as applied to the Douglas fir region involves the following subdivisions:

a. Stumpage cost, including original cost, charges for protection, taxes and care, and, as business men must reckon, interest on these elements. Commercial trading in timber comes under this head.

b. The physical safety of the property as affected by natural agents, particularly the efficiency of fire protective methods in this region and its financial effect.

c. The matter of taxation requires separate consideration.

d. The subject of timber bonds, that branch of timber financing which most intimately concerns the public, requires brief treatment.

e. For the sake of their bearing on public interest and opinion, large timber holdings, their status, prospects and bearings, must be discussed.

Section 2.--Taxation

The burdensomeness of taxation applied to virgin timber arises from two considerations. In the first place a yearly tax is a repeated tax on exactly the same thing; second, there is quite commonly no current source of income to meet it.

To the first principle a rapidly growing forest makes exception, but such tracts are few in the fir country, much fewer than they are in older sections.

Some forest tracts furnish income from grazing, but the cases in the fir country are not many. These excepted, revenue must be derived, if at all, from the marketing of timber. In that connection the fact that only about so much lumber will be absorbed by the market, and that not greatly affected by price, is one of vital moment. Since, therefore, the Douglas fir region apparently has at the present rate of cut 80 years' supply of timber privately owned, the problem of meeting taxation presents peculiar difficulty.

Strong owners with outside sources of income, pay the bill and capitalize the amount in the commercial value of the timber, which they expect operation or sale to make good when the time comes. That process and its effect on stumpage prices will be illustrated in later pages. Strong owners do this, it has been said. Weak owners may have no outside source of income, may in fact be burdened with debt, and therefore not able to do it. In times of active trading relief may come through sale; in such times, in fact, the speculative features of the situation outweigh all others. But it is different quite when the market becomes dull and owners face a long period of holding. At such times there is point to the cry of the burden of taxation.

The facts of taxation as related to timber and the lumber industry of the region, worked up in a substantially accurate way for the year 1913, are as follows:

	Washington	Oregon#
Valuation of timberland* for tax purposes	$82,909,771	$86,079,227
Total tax assessed	3,228,900	1,733,847
Average tax per acre	82 cts.	32 cts.

Tax on Operating Property in the two States

On logging concerns	$176,632
On lumber manufacturers	655,795
	832,427
Add tax on timber	4,962,747
Total paid by industry, shingles excepted	$5,795,174
Total public revenue raised in the region, close to	$44,000,000

On the side of the public, viewing the matter broadly, it may be noted (a) that the tax raised per capita is very high among the states of the Union;(b) that the State of Washington expends more on education per capita than any other State; (c) that about one-third of the total revenue raised in the two states is expended for schools and roads. As to the relative burden borne by different classes of property in Washington, a study made in 1912 by a professor of the State University reached the conclusion that city property was taxed higher in proportion to its sale value than timber, that agricultural property was taxed lowest, and that of public utilities highest of all.

Looking at the matter from the side of the timber owner, the following are broad inferences:

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*Cut-over lands not included, nor some leases, small in amount. The classification "Unimproved Lands," not included, doubtless contains lands with some timber.
#O and C land grant not included.

1. The rate of tax (19.4 mills as an average for the two states) is certainly high; on the other hand, public valuation as a whole is much below commercial valuation. There are timber men who frankly state that in their opinion timber in the two states as a whole does not bear a disproportionate share of the tax burden.

2. Proportioned on the yearly cut, however, the amount is startling. $5,795,174, the total tax paid by the industry, is 95 cents per M on the largest cut of lumber ever produced. To this owners' expenditure for fire protection may be added, which in 1914 was $243,000, bringing the rate on the cut to $1 per M. This is more than half the stumpage charge, or the full charge on more than 3 billion feet of timber. True, only a minor fraction of the standing timber is owned by operating companies, but the revenue has to be raised somehow. As a matter of fact, if not paid from proceeds, it tends, as later explained, to be capitalized in the value of the timber.

Other important considerations, for which the basic data is not always presented, are as follows:

3. Though the tax in the whole region might not be considered excessive, as between different districts and counties there is great variation. In different counties of western Washington of late years, both rate and valuation have varied widely, the combination being such that in 1913 the tax per acre on timbered lands (cut-over lands and leases excluded) was in some counties

more than double what it was in others, the range being from 68 cents to $1.35 per acre. The same condition holds in Oregon.

4. This variability is due largely to a heavy increase in valuation in certain counties of late years, that was so marked and so sudden that it was bound, regardless of its justice, to cause disturbance. The heavy increase in commercial valuation of timber which accompanied the prosperous years culminating in 1907 was followed, somewhat tardily it is true, by sharply raised valuation on the part of public authorities. Snohomish County, Washington, was the first to make a county cruise; that was done in 1908, and the valuation of timberland raised 300 per cent. The heavy rise in the tax burden, as was natural, timber owners met by concentrating operations as far as might be in that county. Similar action has since been taken by the public authorities in most of the western Washington counties and by several in Oregon.

Following are notes showing these relations for two different counties in Washington, the figures relating to those lands classed as "timbered" only. In one county the timber bears half, in the other two-thirds of the total tax burden. The fundamental fact is that the total of money raised was greatly increased in the period. The proportion levied on timber was not much changed by the raise in valuation in either county. The quantity of timber standing was, however, decreasing somewhat, while other property increased*.

*The following, from Oregon, illustrates the sharp and disconcerting raises experienced:

Tax on 9 million feet in 1912	$56.43
" " same timber in 1913	290.43
" " 6,500 acres in 1913	2,100.00
" " same tract in 1914	6,400.00

Valuation of timber in two Washington counties for tax purposes

	1908	1910	1912	1914
Clallam County	$4,452,000	$5,370,000	$8,949,000	$10,062,000
Chehalis "	7,375,000	8,375,000	15,718,000	20,744,000

Large increase in timber taxation is not, however, universal among the counties. Moderate taxation is clearly evinced by the following record of seven years' taxes levied on a certain property in Oregon. Its extent is about 11,000 acres and the estimated stand in 1907 was rising 400 millions which has been cut since at the rate of some 10 million yearly. The tax paid has not shrunk with the cutting, but the owners do not and cannot find fault with the taxation as a whole.

1907	1908	1909	1910	1911	1912	1913	1914
$1,341	$2,335	$1,330	$1,694	$1,612	$1,472	$1,712	$1,970

5. Time relations have made the increasing tax burden harder for timber than it would otherwise have been. The public authorities were behind commercial life in their valuation of timber and in some cases arrived with their increased values just as the lumber business fell sharply off and owners began to debate in their own minds about stumpage. Elsewhere, however, quicker response to business conditions has been had and at a number of points taxation was even lowered on the last assessment rolls. The knowledge is gaining ground that lumber manufacture is not always profitable, and that natural law sets a limit to the possible

valuation of stumpage on which its power to yield public revenue rests. On these points a check in timber buying, withdrawal from the market of some whose continued purchases had kept valuation up, was the most marked and unmistakable sign.

5. Public authorities and others seem frequently to have fallen into an error in this matter from which timbermen as well have not always been free. That is, too much regard for per M prices found current and failure to consider the bearing on valuation of quality, and particularly of the size of properties. When a property of whatever size changes hands, any party interested can not be blamed for taking the price paid as an indication of commercial value. As a matter of fact, however, transactions that take place are mainly of small bodies, a quarter section, section, or a few sections, bought for immediate operation. As a rule, too, because of the economies of lumbering, they are the most accessible bodies, and carry more than the average of quality. The tendency is then to spread the per M value thus found over very large areas.

Aside from the points of quality and availability, a financial fallacy is involved in this course, and the practice of really shrewd and successful timbermen, though that may be based on instinct rather than mathematics, proves it. With a market any way stabilized, and other conditions the same, the same price per M is not, as a matter of fact, paid on a very large property as on a moderate sized or small one. Men understand that before

the whole of the purchase can be realized on such time must elapse, increasing cost largely. Hence valuation they feel must be discounted.

The principle may be illustrated by application to the largest privately owned property in the Northwest, that of the Weyerhaeuser Timber Company and associated concerns, which according to the U. S. Bureau of Corporations consisted in 1909 of about 1,900,000 acres of land with 95.7 billion feet of timber. The price of $6 an acre paid for the original purchase of 900,000 acres is an illustration of the principle, for the going price of claims in 1900 was much more than that; and comparison of the tax burden borne today with indications of the income possible to be derived still further illustrates it. The tax paid is not exactly known, but has been arrived at by proportion from the amount of the timber holding and the total tax paid on timber in the two states. The sum is slightly over $1,000,000. This concern, therefore, if it puts a price on its timber averaging $2.50 per M must sell more than 400 millions yearly merely to meet its share of the public revenues. The construction of the great new mill at Everett, a move contrary to the original policy of the company and regretted by the industry at large, not improbably has a connection with that fact. There is also illustrated a matter that will be more fully developed later, the fact that original cost has but a small bearing on current prices for stumpage.

The adjustment of this matter clearly lies with the people of the two states. Public revenue they must have, but for the sake of that very object it is to their interest to maintain conditions which make it possible to raise revenue. Numerous conservative residents believe that the region is too ambitious, not sufficiently careful and prudent, and responsibility for this they consider is diffused, not to be laid at the door of any class or of public officials. In this connection the recent passage of budget laws and widespread public discussion are noteworthy, also the coming together at some points in a friendly spirit of large taxpayers and public officials, the former lending their financial experience to the public authorities and receiving a considerate hearing in turn.

Section 2.--Fire Loss and Protection

The organization for safeguarding from fire the forest resources of the two states is of a cooperative nature, the general Government, the states and owners all being involved in it. The organization of the Forest Service in protecting the nationally owned timber within Forest boundaries aids in the protection of privately owned timber within the same lines. In addition the general Government assists in the protection of private timber on watersheds of navigable streams under the Weeks Law.

The two states have had forest fire codes in force for some years. Each provides for an unpaid board of representative

citizens serving for regulation and advice, and for a State forester who, with some other obligations imposed, is responsible for the protective work done and controls public expenditures therefor. Both states appropriate considerable sums for protection purposes, but the two differ in the manner of expenditure. Oregon law makes the broad requirement that "every owner of timberland in the State shall furnish a sufficient fire patrol therefor during the season of the year when there is danger from forest fires," going on to define the character of patrol, to require that it shall meet with the approval of the State Board of Forestry, and leasing it for police purposes the authority of the State. Oregon's expenditure is jointly with that of owners in the maintenance of a cooperative patrol system; Washington maintains at public expense an independent warden and patrol force supplementing the force of the owners. With the usual provisions applying to causes of fires, to responsibility for damages, to railway practice and rights of way, the above constitutes the states' share in the protective system.

Timberland owners of both states are organized for fire protection in flexible ways adapted to the needs and conditions, while the Western Forestry and Conservation Association, grouping together such protective associations in the whole Northwest, through annual meetings and an executive officer at Portland, keeps the whole interested, informed and up to tone. This system has grown up within about a decade. The National forces for protection were first in the field; the owners of timber came next

with serious efforts and expenditures; the states came in later, thus solidifying the system. All things considered, the rapidity of growth and its results seem highly creditable. The work is progressive and very much alive.

Expenditures and losses sustained have been obtained with approximate accuracy for three years ending with 1914, and, segregated for privately owned timber and the National Forests, are given below. In both divisions of expenditure a share was incurred for trails, telephone lines, etc., constructed for the benefit of the future as well as the present, and therefore of the nature of a capital expense.

Fire Protection Cost on Private Timber

	Oregon			Washington		
	1912	1913	1914	1912	1913	1914
State and county Exp.	$10,904.07	$14,153.13	$16,312.48	$14,337.50	$11,101.70	$25,172.76
Federal Exp.	*6,820.00	7,857.70	16,280.05	*2,731.25	4,155.75	7,086.97
Exp. by Assn. and individuals	46,544.11	50,664.59	115,672.61	°39,889.00	°36,191.52	129,405.73

Losses Sustained

	Oregon			Washington		
	1912	1913	1914	1912	1913	1914
Timber loss and damage	$40,463	$ 230	$18,608	$149,040	$ 300	$19,307.50
Camps, equipment, logs, etc.	3,427	6,429	44,982	———+	———+	77,145.50

Summary of Expenditures and Timber Losses of Private Parties

Oregon and Washington Together

	1912	1913	1914
Exp. by private parties	**$86,435.11	**$96,191.52	$243,156.00
Per acre of timbered land	...	...	2.2¢
Timber loss by private parties	189,503.00	530.00	36,915.50
Percentage of taxed valuation, 1913,	1/9 of 1%	Negligible	$\frac{1}{65}$ of 1%

Protection Expenditure and Timber Losses on National Forests Within Washington and Oregon west of the Cascades

	1912	1913	1914
Cost of patrol, fire fighting, improvements and share of general expense	$175,565.18	$95,735.68	$83,889.41
Per acre protected	.0167	.0086	.0077
Estimated timber losses (M ft.)	3,064	3,335	79,972

*Expended on the watersheds of navigable streams under the terms of the Weeks Law.
**Incomplete.
+No record.
°Partial only. No record of individual expenditure.

The short period which it is possible to cover statistically, dictates caution in drawing wholesale inferences as to loss. Here, however, general facts come in to corroborate. 1914 was a very bad and threatening season in the whole Northwest. The region in question experienced two and a half months without rain; nearly 200,000 acres of logging slash burned over; but the danger to timber was met with excellent effect, as the figures show. Between 1910, the last previous season showing similar conditions and that named, the effectiveness of organization and men's confidence in their ability to handle the fire situation distinctly gained. The present state of affairs and opinion has been summed up as follows by the Forester of the Western Forestry and Conservation Association.

> "On the whole forest protection has been perfected to keep the loss of life and property down to a negligible minimum in the ordinary season. It is comparable to the efficient city fire departments which occasionally meet a Baltimore or San Francisco fire, but as a rule make the difference between intolerable danger and reasonable safety."

Granting the accuracy of that statement, it only remains to be said that while serious losses no doubt must yet be suffered, and only insurance*, which has not yet been worked out for timber in this country, could prevent them from causing to an occasional owner disastrous loss, assurance is felt that future losses will be small in the aggregate.

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*May 1916, plans for timber insurance are just being proposed.

The rate of deterioration of fire-killed timber is a matter of moment in connection with fire loss. This varies greatly with the species and quality of timber. Hemlock sapwood blackens quickly when fire killed, and that wood in the present state of the market is not considered capable of salvage. Spruce also goes to destruction very quickly, while fire-killed cedar remains capable of use for an indefinite time. As to fir, the possibility of salvage turns on its age and size. Between borers and decay young timber with heavy sapwood goes to destruction quickly, while large yellow fir has been logged to yield 50 per cent of the normal cut 10 to 15 years after the trees were killed by fire.

The meagerness of existing data on destruction of Coast timber by insects is so marked as to indicate that, except for spruce, little danger need be expected from that source. Wind, too, is the cause of but slight loss in the Coast forests. Outside of fire, therefore, decay is the chief source of loss. The difficulty of estimating the extent of this loss has already been indicated. Very little is known of the rate at which it progresses.

A chief bearing of all the above facts is on the financial relation of timber investments. Timber in this region is safer property, physically speaking, than it has generally been looked on, whether in this region or the country at large.

Section 4. Timber Bonds

This method of financing timber holdings was first employed in the southern pine region where, beginning soon after 1900, it was developed on a large scale by 1907. The Douglas fir region was later in using this form of credit, the bulk of the issues being put out in 1912 and 1913.

Starting conservatively and on a small scale, this form of investment had wide popularity for several years, and acquired the same vogue and momentum that some other forms of investment have had. It was carried along by the general wave of optimism about timber values; the interest of the financial houses had a strong accelerating effect; the fact that timber quantity and value and the economics of lumber production are not matters of common knowledge and competence have rendered it rather more than usually easy for men to be deceived.

Of the bond business in the fir country the following are generally admitted facts:

1. Several issues put out were made carelessly, on wrong estimates of quantity and inflated valuations.

2. While the issues almost uniformly bear six per cent interest, the terms of issue and sale are such that the mortgager pays seven per cent at the least on what is actually realized, eight per cent or more in some cases.

3. The purpose of these issues has been more to carry timber than to finance operations; real financial ease therefore has not always been secured.

4. The term of the issues is short, averaging in the fir region about 10 years on timber bodies adapted to operations of much greater length. The short term suits the requirement of the investor, but the heavy sinking fund payment involved, frequently set at double the rated stumpage valuation, makes the obligation a hard one to meet.

5. The fixed time of sinking fund payment ill suits the lumber industry with its instability. Times of depression bear with especial force on bonded concerns, and the fact has in turn contributed to overproduction and depression of price.

6. The broad fundamental facts of the case--timber quantity in the region, the volume of cut and realization in relation to holding charges, the difficulty inherent in an investment of this kind--seem not to have been apprehended earlier and more clearly by the bankers than by lumbermen themselves.

The first payments of principal on numerous bond issues based on fir timber came due within the last two years in a time of marked depression. Some were defaulted or carried by the financial concerns, and the same thing took place in other regions. While, therefore, in very few cases anywhere have timber bond-holders failed to realize their equity and numerous issues were thoroughly conservative and safe, the lumber industry itself has suffered some heavy losses and the business of timber bonds has been given a decided setback. It appears now to be reorganizing on the following improved lines:

1. The necessity of thoroughly reliable dealing with quantity and quality has been recognized, and facilities for that purpose are greatly improved.

2. The terms of the bonds are being improved in respect to flexibility as to payments, the effort being to ease the operator's situation in periods of low demand and price.

3. It has recently been noted that timber under modern methods of protection is becoming safer physically than men have usually supposed it could be made. That fact, together with the attainment of greater confidence and soundness in the operating business, should in time operate to reduce the interest rate.

About $54,000,000 in this form of securities had been issued in the Douglas fir region up to the end of 1915, and the amount outstanding at that time, as near as has been ascertained, was $45,558,000. The interest due for the year 1916 is approximately 2-3/4 million dollars and the principal payment 4-3/4 millions. The sum of the two is $1.24 per M on six billion feet, taken as the cut of a normal year. Fifteen per cent of the bonds out are on timber alone with no active operation attached.

Section 5.--Stumpage Cost

Timberland was first acquired in this region under the Preemption and Cash Sales Acts; the price paid the government was $1.25 an acre, and that for a period in depreciated currency.

Land acquired under the Timber and Stone Act cost the claimant $2.50 an acre plus fees aggregating commonly around $50.00, the expenditure of more or less time, and in later years a location fee to some cruiser. Homesteading so complicated the matter of cost that there is no possibility of standardizing it.

The above covers first cost only. With the patent of land it came at once under local taxation. The burden from this direction, it is true, in the early history was minute; it has, however, steadily increased. In addition there is usually in connection with timber property some small expense for care and protection. These charges are current. Against all these expenses, owners who maintain the financial point of view toward their property reckon interest.

Present Cost to Original Holders

Following is the record of taxes paid on a certain 40-acre tract in King County, Washington, from 1873 to 1906, inclusive. It was patented in 1866; the government received $1.25 per acre, and the timber land holder settled on whatever terms he might with the claimant. The present owner as a matter of financial interest computed original cost and annual tax payments on this forty at six per cent compound interest, and that process, taxes during the early years estimated at $1.50, gave him a cost in 1906 of $1,373.17. Fifty M per acre is a usual timber stand for the region, which gives a per M cost in 1906 of 69 cents. Objection might be made to compound interest. On the other hand, in the earlier period of the history 12 and 15 per cent were current rates.

Record of Taxes Paid on a 40-acre Tract in King County, Washington, from 1873 to 1906

1873	$1.54
1874	1.87
1875	1.75
1876	3.44
1877	2.86
1878	4.07
1879	2.13
1880	4.53
1881	4.80
1882	5.20
1883	1.87
1884	2.02
1885	1.50
1886	2.40
1887	5.60
1888	2.80
1889	4.80
1890	7.08
1891	18.86
1892	12.58
1893	11.85
1894	12.00
1895	16.55
1896	11.42
1897	16.31
1898	12.69
1899	14.77
1900	16.15
1901	14.85
1902	7.61
1903	6.52
1904	21.34
1905	6.79
1906	29.16
	$289.71

Computed Cost in 1908

$50 paid 1866 compounded to 1908 at 6%,	$577.81
Taxes paid " " " " "	975.36
69¢ per M ($34.33 per acre)	$1,373.17

A third instance of claim ownership, from still another Washington County and of later date, is 80 acres on which location and final proof were made in 1903; ownership in 1914 still remaining with the original claimant:

Original Cost		Taxes	paid
Locating fees	$50.00	1904	$11.00
Filing	10.00	1905	11.00
Advertising	10.00	1906	16.40
Final proof and witness fees	25.00	1907	16.22
Purchase price to Government	200.00	1908	16.75
		1909	15.34
Total original cost,	$295.00	1910	25.96
		1911	29.36
		1912	24.20
		1913	34.14
		1914	32.15
			$232.93

Cost in 1914

Original cost,	$295.00
6% interest to date,	194.70
Taxes paid,	232.93
Interest on,	53.90
	$776.63

The county cruise on this claim is 2,030 M feet, so that present cost as reckoned is again 38 cents per M. The timber is hemlock mainly, and present valuation for tax purposes $955.25. Standing far away from logging operations and having on it not much either of cedar or fir, this claim, although $2,000 was offered for it in 1909, is not salable in the present state of the timber market.

Example 2. A quarter section in Pacific County, Washington, taken up in 1890, bearing according to the county cruise 7,550 M feet, mainly fir timber. The taxes were taken from County Records. Very slight expense has been required for protection and care. The cost in 1914, as reckoned below, reached 38 cents per M.

Taxes paid.

1892	$14.99
1893	17.92
1894	17.76
1895	26.32
1896	19.60
1897	12.40
1898	10.40
1899	13.20
1900	19.80
1901	20.40
1902	13.60
1903	16.00
1904	17.60
1905	17.60
1906	26.24
1907	33.07
1908	99.58
1909	92.72
1910	127.32
1911	137.13
1912	152.55
1913	242.46
1914	190.74

Cost 1915 as it Might be Reckoned

Estimated cost of location and proof, - - - - - - - -	$50.00
Price paid the Government, - - - - - - - - - - - - - -	400.00
Simple interest on above to 1915, at 6%, - - - - - - -	648.00
Total of taxes paid, - - - - - - - - - - - - - - - - -	1,339.40
Interest to 1915, - - - - - - - - - - - - - - - - - - -	400.57
	$2,837.97

Claim taking as a business

From the history earlier given, it is clear that at certain periods and places at least, there has been a market price for claims dependent neither on the cost to the claimant nor altogether on the price received for lumber. Following are two instances of the process of transfer, both quick and systematic, one yielding a handsome profit, the other a very moderate one.

No. 1. 160 acres taken up in 1905 and sold in 1908. County cruise shows 6,800 M feet of timber, mainly hemlock and amabilis fir. The cost and profit to the original claimant were as follows:

Locating fee, paid the Government, and expenses	$595.00
Interest on above at 6%	142.80
Taxes 1904 to 1907	128.91
Interest to time of sale	10.24
	$876.95
Sale made at	1,800.00
Leaving profit of	$ 923.05

No. 2. 160 acres taken up in 1905, sold in 1907 to one of the great timber-holding companies. The county cruise, believed to be 30% low, shows 7½ million feet of timber, largely cedar, on the property. The cost and profit of the original claimant were:

Locating fee	$185.00
Paid the Government	400.00
Other original expenses	70.00
Interest at 6% on above costs to 1907	142.90
Taxes paid 1905 to 1906	105.88
Interest on taxes	8.54
Total cost to claimant	$[illegible]
Sale price	4,000.00
Profit	$3,147.68

Total cost to claimant

The above illustrate fairly many thousands of cases that have occurred in the two states over a long period of years. The exercise of one's rights in the taking up of land, timbered as well as agricultural, was for many years general and normal practice through this western country, a sale outright being the next step in the majority of cases. Claim taking, however, has not always been a profitable business. Homesteading indeed complicated the matter, and was not seldom accompanied by hardship. Then at different points in the region where ownership is not yet consolidated there are today hundreds, perhaps thousands, of homesteaders and claimants who after putting out more or less time or money in the acquisition of land have been caught in the recent reaction of the timber market. These men, like large timber holders, may have to hold for a long time, and meanwhile must raise yearly cash to cover their taxes.

Cost to Second and Third Owners

This may be illustrated by carrying on some of the cases just cited. In the first case for instance, land taken up in 1865, as reckoned with financially by the owner, in 1908 had reached in cost $34.33 per acre. With increasing taxation since, it approaches or equals $60 per acre today, or $1 per [illegible]. At present the annual tax is $1.12 per acre, while current interest, 6% on $60, is $3. The sum of the two, $4.12, is 3 cents per [illegible] approximately for the annual carrying charge. This is vastly greater than at the start; in fact several times the original cost of the timber. Annual carrying cost is rising into significant figures.

Rising cost in moderate degree may be illustrated also by carrying further the history of the claim noted recently, the one sold in 1907 for $4,000. Brought down to 1914, as shown below, this stands the present owner, with taxes and interest at 6%, more than $6,800. Original cost in 1902 was 8.2 cents per M; in 1907, at the date of the transfer, taxes and interest had raised it to 11.8 cents. The new buyer paid 55 cents, however, and starting from this point again with the increasing charge, its cost in 1915 is 94 cents per M. This timber, moreover, is so located that it must be held a decade or two before it is realized on. It may very well be, therefore, even if no transfers occur meanwhile, that when that time comes it will stand the owner on a commercial basis $2 per M. Interest on present cost with the taxes of 1914 amount to $580 annually, 8 cents per M more than the Government received in 1902, almost exactly the total cost to the original claimant.

Taxes paid on claim		Cost in 1915	
1907	$ 32.23	Purchase price, 1907	$4,000.00
1908	112.84	Interest on it at 6%	1,680.00
1909	102.00	Taxes paid	940.07
1910	114.50	Interest on them	158.40
1911	110.31	Paid for fire protection	28.80
1912	142.40	Paid for cruising	15.00
1913	155.19		
1914	170.60	Total	$6,822.27

Cost Increases Progressively: Relation to Operation

The thing suggested in the last paragraph, holding charges mounting up on timber bought at comparatively high figures, may in fact be found illustrated at many points in the region. For instance, a body of 313 million feet as near as can be judged, of mixed fir, cedar and hemlock, bought in 1911 for $580,000, or at the rate of $1.82 per M on the mill product, is the proposition which one operating plant has to make good on. Interest is actually paid on a considerable portion of the purchase price, and 8 per cent to cover interest, taxes, risk, and protection cost seems to be due for satisfactory business returns in that branch of the operation. That on the cut of the first year alone and by itself is 14½ cents per M, a charge which is multiplied in succeeding years unless cut down by being met some way in advance. Even with investment reduced through the yearly cutting of 20 or 25 millions, stumpage cost in this case is bound to run up to figures much above the purchase price before the end of the cutting period.

Another illustration in the same line; a logging company in Washington is operating in a tract of timber calculated to make it 10 years' operation. The price was $3 per M and on this, reduced by payments made as rapidly as financial safety allows, interest is paid. The average of this interest and the yearly timber tax make up, as near as can be ascertained, a charge to be applied to the whole quantity of 40 cents per M.

The last two, it is to be noted, are operating properties. High valuation, and high carrying charges dependent thereon,

naturally accompany, and sometimes force, operation. When an owner finds the charges burdensome, or loses faith in timber as a holding investment, immediate operation is his natural resort.

Timber Trading

The part of the middleman or trader, the man usually with thorough woods knowledge who acts as go-between for claim holder and the heavy, long-range buyer, is well illustrated by the following:

Just before 1900 a man of this kind picked up 26 40's and turned them over to a Michigan concern for $14,[illegible], an advance of $3,500 to him. Again 5 years later the same man blocked up 2,080 acres for $50,000 and turned them over for $4,000 advance. At this time the market was fluid. Within 6 months $70,000 was offered for the same property and declined. For some years past this property, cruised at 125 millions, has been held at $150,000.

The middleman in this case was moderate, hardly receiving pay for the training which successful conduct of such business demands. Modesty was not characteristic of the class, however. An example of heavy profit in timber trading, combined in this case with holding for a considerable period, also with timeliness in both purchase and sale, is of 980 acres blocked up for $29,[illegible] in the year 1900, noted earlier to have been the opportune time for investment in this country. This tract was sold to an operating company in 1910, after 10 years holding, for $1[illegible],000,

liberal profit certainly, even when cost of all kinds is fully allowed for. The purchasers, however, did not come out so well. They were not speculating, but had to meet external conditions. They were unable in fact to come out even, and in 1914 made settlement with their creditors on terms embarassing to all concerned.

Some, on the ground of sharp practice and of occurrences like the above, inveigh against the trader and speculator as a disturber of productive industry, laying a grievous burden on other men. Such transactions are not peculiar to timber, however, and in fact, organized as it was, the trader had a legitimate place in the business. The following has, however, been said by a resident of the region, well disposed toward it and perfectly familiar with its affairs: "There has been too much speculation, too much wild buying with a view of unloading on some one else, and too much scrambling after commissions." Such trading undoubtedly had an effect on the valuation of stumpage.

Source of Some Noteworthy Fortunes

Opportuneness in selling timber has been mentioned, and to that in fact, as well as to actual rise in the valuation of stumpage, is due the reputation for heavy profit attached to the business. The men who have reaped the greatest undoubted profits are some who, by instinct apparently, have known when to sell out. Many instances are known in the region of men who

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allowed for. The purchasers, however, did not come out so
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They were unable in fact to come out even, and in full made
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some one else, and too [illegible]
Such trading undoubtedly had an effect on the valuation of
[illegible].

[illegible]

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[illegible]

in their early days worked at manual labor in the mills or woods, who branched out into operation, and, successful at that, had also faith in the future of timber and self-denial which prompted them to save and invest their surplus in that form. In this many took heavy chances and had their narrow escapes, but large rewards were reaped in the period 1906 to 1910, when, at what proved to be the opportune time, numbers of them sold out. The men who bought their property could not tell exactly the same sort of story.

Review

The phenomena of the period from 1900 to date are (a) an expanding and profitable productive industry up to 1906, with more and more timber coming into commercial ownership, rather active timber buying and a rising price for stumpage, the last three years being more active than their predecessors. In the fluid condition and on the low prices of the time quick and heavy profits were often realized. (b) a boom in lumber lasting for 18 months in 1906 and 1907, accompanied by a lift of stumpage valuation to a much higher general level which held for some years; (c) rather close times in lumber, 1908 to 1913, with a growing check in timber activity, started by the most far-sighted buyers; and (d) a real drop in commercial esteem of timber as property, evidenced by a very dull market and numerous cases of sacrifice sales and reduced price. In this, small men as well as large have suffered.

The price levels for stumpage attained, and that were for some years maintained in the region, are indicated by the following:

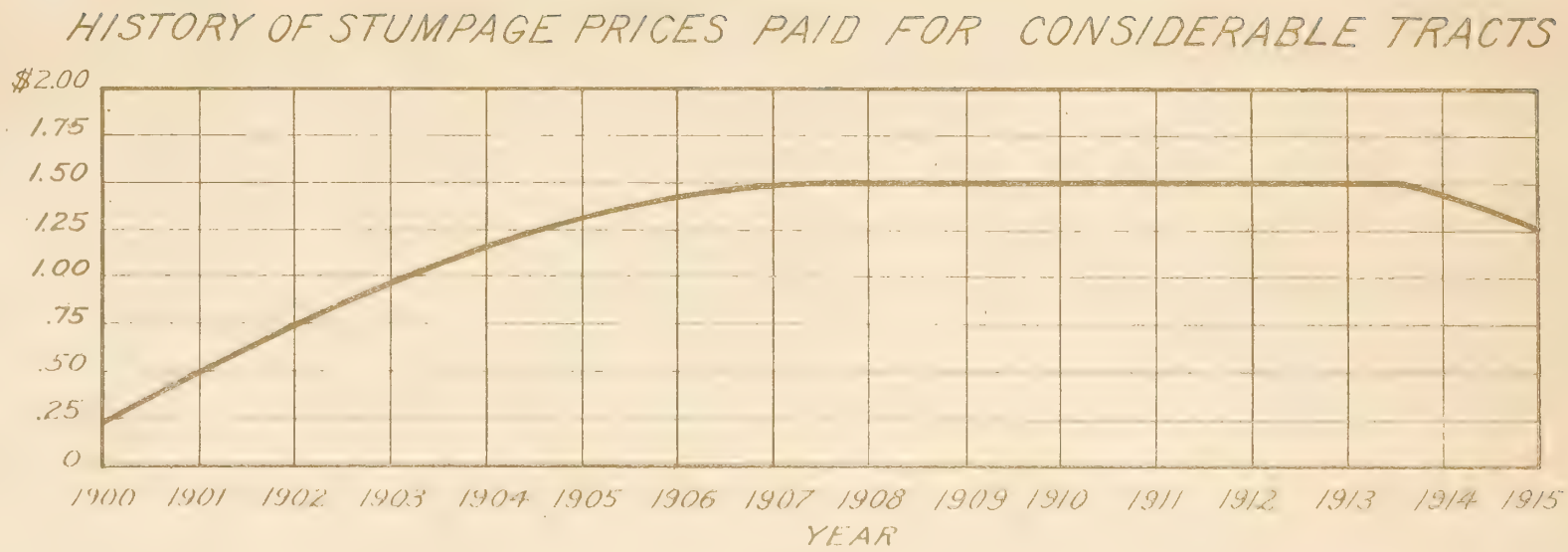
a. Sales by the United States Forest Service in the years 1907 to 1910 averaged $2 per M for timber of the better quality and location (in neither respect is the National timber equal to the average of that owned by private parties).

b. The Indian Office in September, 1914, made a sale of timber of good quality and very favorable location at the following prices: $4.50 for cedar; $3.87 for fir and spruce, and $1 for hemlock.

c. The city of Seattle in 1914 sold from the area of its proposed reservoir towards 100 million feet of mixed timber at the following rates: $2.50 for cedar; $2.01 for fir; $1.25 for spruce; 75¢ for hemlock and noble fir:--average about $1.75.

d. A section of rather low grade timber, costly to operate, surrounded by slash so that the fire risk was great, was sold in 1913 from the land grant of the S. P. Railway by agreement with the Government at $1.06 per M.

e. The agents of the U. S. Bureau of Internal Revenue in checking returns for the corporation tax which went into effect January 1, 1909, on the basis of sales of timber current at the time, set prices of commercial stumpage then being cut at from $1 to $2.50 per M, with $3 for a very few tracts.


HISTORY OF STUMPAGE PRICES PAID FOR CONSIDERABLE TRACTS
$2.00
1.75
1.50
1.25
1.00
.75
.50
.25
0
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
YEAR

Figures for the shrinkage in commercial value from 1912 to 1915 are hard to set because a very dull market with few transactions is the chief phenomenon of the period. Some holders indeed deny the fact of shrinkage, and, being able to do so, are holding firmly. It is otherwise, however, with the majority. Numerous offers of property have been made at prices that were rejected in years past, in some cases at much lower prices. Several sales have been made under compulsion and at great sacrifice. A banker in interior Washington, owning some small tracts himself, will not buy now for a quarter of the rates he was formerly willing to pay, and states that the farmers in his neighborhood got about 50 cents in 1915, whereas they formerly sold at $1 and $2. Only one case has been learned of where two transfers of the same land took place during the period at a liberally advancing price, such as characterizes an easy and normal stumpage market. As a whole the statement of a well-informed man in the industry that the general level of timber valuation has shrunk 20 per cent, low quality and distant timber much more, seems as accurate as any that could be formulated. The curve appended represents in a composite way the prices at which properties of good quality and considerable size changed hands since 1900. The long period of stationary prices, in view of popular impressions about stumpage, is especially noteworthy.

After the foregoing, the very divergent situation of different concerns in respect to the cost of their timber is readily understood. Side by side oftentimes are concerns which

bought very advantageously, at some opportune period or after a failure, and concerns which came in later or for some other reason paid comparatively high prices for the timber they own. This fact is one main cause for that instability in the market which is characteristic of the region; other causes and the undesirable results are developed in the part of this work devoted to the productive industry.

Section 6.--Problems in Stumpage

Several problems in finance and accounting arise in connection with stumpage. The first to be treated is the operating property. For this purpose investment in timber is separated from that required for operation.

Operating Properties--Short Term

Accounting practice justifies the addition of current costs for protection, taxes, and interest paid out to original cost of timber and prorating the sum of such charges at the time arrived at over timber cut. The business equities of the matter are somewhat more adequately handled if an interest rate is applied to the investment from the start.

This matter has been occasionally treated in practice according to the following method. The suppositions made for illustration are a property of $50 millions bought for cash; taxes and protection cost, 1 per cent yearly; 6 per cent to cover interest return expected, with risk; yearly cut 50 millions; detail time relations as indicated in the computation:

	(250 millions bought at $2.50	$625,000	Stumpage
First	(Taxes and interest at 7%	43,750	charge
year	(Cost at end of year (2.675 per M)	$668,750	per M
	(Cut 50 millions at this rate	133,750	$2.675
	(Investment remaining	$535,000	
	(Taxes and interest at 7%	37,450	
Second	(Cost at end of year (per M $2.86)	$572,450	
year	(Cut 50 millions at this rate	143,112	2.86
	Investment remaining	$429,338	
	(Taxes and interest at 7%	30,054	
Third	(Cost at end year (per M $3.06)	$459,392	
year	(Cut 50 millions at above rate	153,131	3.06
	Investment remaining	$306,261	
	(Taxes and interest at 7%	21,438	
Fourth	(Cost at end year (per M $3.28)	$327,699	
year	(Cut 50 millions at above rate	163,849	3.28
	Investment remaining	$163,850	
	(Taxes and interest at 7%	11,469	
Fifth	(Cost at end year ($3.506 per M)	$175,319	
year	(Cut 50 millions at this rate	175,319	3.506

Soil value is omitted from consideration in the above. In practice actual taxes and protection cost are substituted for supposititious values, and for amount that actually cut, however irregular that might be. The main inference to be drawn is that, to make satisfactory business returns, stumpage must be charged to the operation at a rate greater than the original purchase price. This when handled as above increases progressively. Making, however, suppositions as to cost and rate of cut that fit the case, a single stumpage rate may be worked out in advance, which at the end of the cutting period will extinguish the investment. $3.04 per M will do that in the above conditions.

Operating Properties--Long Term

The above method has been applied at least once in figuring on a long-term timber prospectus. Stock for 20 years could be purchased for approximately $1.62 per M, and assuming steady operation, yearly charges for stumpage figured as above, but with 4 instead of 7 per cent as the rate, resulted as follows. From $1.62 the first year, the per M charge rises to $6.99 at the end of the period. To these sums, estimated operating cost, plant depreciation, and returns due on operating capital were added, giving as a result lumber prices considered to correspond with fair profit on the investment proposed to be made.

Yearly charge to operation through 20 years, of stumpage bought at $1.62.

1st year	$1.62
2nd "	1.73
3rd "	1.83
4th "	2.04
5th "	2.20
10th "	3.24
15th "	4.76
20th "	6.99

The increase in the above figures, with the resultant effect on lumber prices, is striking; it is, in fact, hardly within the range of probabilities. The proposition may be made to look much more plausible if the high rates of the later years are lowered, while those of the earlier years of the operation are raised

to compensate. Thus, substitution for the first four years of $2.40 per M instead of the rates given, with $2.90, $3.40, $3.80, and $4 for the ensuing four-year periods, very nearly extinguishes the investment. So will $2, $2.75, $3.50, $4.25, and $5 if those figures look more reasonable. A uniform rate that will extinguish the investment in 20 years is $3.375.

Different results are arrived at (and the procedure conforms also with the practice of some other parties) if each year's cut is treated by itself, its share of taxes and protection costs being added yearly, and simple interest from time of purchase to time of realization charged upon it. Figures worked out by this method on the same data as before are now set alongside the others to show the difference. This is essentially that between simple and compound interest:

	First Method	Second Method
1st year	$1.62	$1.62
2nd "	1.75	1.74
3rd "	1.89	1.86
4th "	2.04	1.98
5th "	2.20	2.10
10th "	3.24	2.70
15th "	4.76	3.30
20th "	6.99	3.90

Considered as guides to actual investment, it is clear that such computations are greatly limited because even if a

principle that is satisfactory in settled area, strange elements of variation exist in the fundamental elements of cost. Three inferences which have practical bearing may, however, be drawn from the figures; of these, two are parallel with the practice of shrewd timber investors.

1st. Despite expected rise in the price of stumpage very large properties are not considered basis at the same rate as moderate sized or small ones, but at lower rates.

2nd. Same possible, a buyer of timber usually cuts at once to reduce his investment. Quick trading, therefore, unless purely speculative, has proved in the past active operation, while under settled ownership timber property has been more likely to rent.

3rd. Timber bonds if considerable in amount and no longer in term than usual put a heavy burden on the borrower in the early years of his operation. On the other hand, with indebtedness cleared off, in the late years cash realization may be very rapid. Phenomena of this nature were common among the lake shore operations some decades ago.

Holding Properties

Several computations illustrating finance in these cases were given on pages to and following in another, based on experience had, and worked out by the owner of the timber for a period of 10 years;

Paid for 500 million feet at 51¢ per M	$255,000
Simple interest at 6% for 10 years	153,000
Ten years' taxes	36,360
Simple interest at 6% on taxes from date of payment	12,155
After 10 years	$456,515

The starting price of 51 cents, at the end has become 91.3 cents. If he were to sell at that price the owner figures that he would receive six per cent return on investment, any excess being "velvet."

It is next to be noted that in 10 years the figured price of this timber has nearly doubled. This expression, doubling in value, is one frequently heard in connection with timber. As met in the business world, it runs most commonly to the effect that stumpage, to yield fair returns on investment, should double in value in either 8 or 10 years. Actual taxes and protection cost, with risk, have been generally felt to require that. This rule as applied to long periods of time is open to question or qualification on a number of grounds. It will, however, serve as the basis of some deductions. For this purpose the doubling in ten years principle is illustrated in the following table, carried out to 40 years and applied to stumpage valued at different rates. Soil value is neglected in this figuring; so is the possibility of paying current cost from current income, as for instance from grazing:

Fell for 500 million feet at 6½d per M . . . . . $[illegible]

Simple interest at 6% for 10 years 183,000

Old owner's [illegible]

Simple interest at 6% on taxes from date of payment 18,128

After 10 years $456,128

The starting price of 51 cents, at the end has been 91.5 cents. If he were to sell at that price the owner figures that he would receive six per cent return on investment, any [illegible]

It is next to be noted that in 10 years the figure price of this timber has nearly doubled. This expression, doubling in value, is one frequently heard in connection with timber. As met in the business world, it runs most commonly to the effect that stumpage, to yield fair returns on investment should double in value in either 8 or 10 years. Actual taxes and protection cost, with risk, have been generally felt to [illegible] quite that. This rule as applied to long periods of time is to question or qualification on a number of grounds. It will however, serve as the basis of some deductions. For this purpose the doubling in ten years principle is illustrated in the following table, carried out to 40 years and applied to stumpage valued at different rates. Soil value is neglected in this figure as is the possibility of paying current cost from current income as for instance from grazing:

Present value	$.25	$ .50	$1.00	$2.50
After 10 years	.50	1.00	2.00	5.00
" 20 "	1.00	2.00	4.00	10.00
" 30 "	2.00	4.00	8.00	20.00
" 40 "	4.00	8.00	16.00	40.00

In connection with the above, the following observations have point:

1. Protection, a matter which is only now getting fully to bear, eases the case financially so that the public is both directly and indirectly interested in that. Safety secured, timber investments should be attractive at low interest rates, their security, length of term and the staple nature of the article all being elements in the case. Viewed in this way, few available forms of investment can equal them.

2. That consideration leads to the permanent, professional timber holders who have the long outlook, a kind of ownership treated more fully later on. It is not impossible, too, that in the future, with improvement in conditions and in confidence, there may be greater diffusion of financial interest in timberlands.

3. Long-term holding is a clear impossibility in connection with high priced timber, but the lumber industry, acting instinctively perhaps, but still according to sound economics, has always cut such timber first. A collateral point is that an equalizing influence is thus put into lumber prices.

4. Proceeding in this way from higher to lower priced timber, with an increase in lumber production expected as well,+ the Northwest may largely ease the financial proposition it has on hand which to some has looked very difficult.

5. Some of the figures above are clearly irrosaible. It is unthinkable that a free people should submit to such charges for what originally was the gift of nature; nor is it likely that they will have occasion to do so, for new growth of timber if nothing else would cut such charges off.*

6. Public ownorship of the reserves of timber receives clear economic justification from this source. To the simple holding of such timber, aside from expenses incident to its use, no cost attaches except that for protection, while public revenue derived from taxation can be replaced by a very small volume of sales. The public timber furthermore is, by reason of location and quality, mainly such as should be held as a reserve supply.

+For explanatory discussion see pages and .

Note on Second Growth and its Relation to the Timber Problem.
*The producing power of good forest soil in this region is remarkable, the studies of the Forest Service indicating for full stands on rotations of 50 to 80 years a yield in saw timber of about 800 feet per acre a year. Nor does that statement sum up all the possibilities in the case, for second growth stands in favorable location have occasionally been found yielding handsome returns to their owners through thinnings and advance cuttings, while possible advance in utilization holds out the possibility of much larger yields. Thus a small piece of Douglas fir growth about 40 years of age grown up after early logging on the land of one of the old companies on Puget Sound was found, when carefully estimated, to have on it 18 M feet to the acre according to the usual Maine standard of saw logs, 40 M feet as such growth

would be cut by New England portable mills. Where it stood, however, this growth was not thought of as timber or even in connection with fire protection.

This attitude toward second growth is characteristic of the region which still possesses such a wealth of virgin timber. Yet it seems not at all unlikely that increased population in the vicinity bringing in a larger volume of factory work, coupled with favorable location relative to that of the virgin timber at a later date, may bring on such utilization and create such values earlier than is now thought. The low cost required for the manufacture of such timber has already been shown, and on suitable ground it is cheaply logged with horses.

Leaving the above considerations aside, the cost of raising saw timber has been computed by a professor at the University of Washington as follows: land value reckoned at $5 per acre and cost of starting the stand $5 (an average between 0, the cost of natural reproduction, and $10, that of full planting); 20 cents per acre yearly allowed for protection and care; yield tax of 25 per cent of stumpage value assumed as taken at the end. Then, at 3 per cent compound interest on all investments the cost of lumber at 60 years will be $3.51 per M less possible thinnings; at 4 per cent, with other suppositions the same, $6.16. Supposing natural reproduction secured by seed trees, the present system of taxation, and allowing 4 per cent compound interest, the Forest Service has figured about $2 per M as the producing cost.

The suggestion that data on area and growing power be combined in a rough estimate of what the region, given only fire protection of a reasonable kind, will produce of itself, resulted as follows: Suppose half the area of the region, 17,000,000 acres approximately, is now growing up after cutting and fire or will so do after the timber is removed; suppose this area produces at half the rate characteristic of full stands, 400 feet per acre and year; then the yearly production would be 6,800,000 M feet, an amount greater than the present cut.

Section 7 - Concentration of Ownership

Conditions in 1909

The ownership of timberland in this region was exhaustively treated in Volumes I-III of "The Lumber Industry," by the U. S. Bureau of Corporations. Findings, as of the year 1909, run to the following effect:

1. It was pointed out that private holdings of timberland had gone very far beyond the requirements of the producing industry while the further fact of great concentration of ownership was brought out. In the two States west of the mountains, 47 large holders including two railroads were stated to own 43 per cent of the privately owned standing timber, 32 per cent of the whole.

2. In the same region, the Weyerhaeuser Timber Company, owns 95.7 billion feet standing on about 1,900,000 acres of land. The timber is 11.4 per cent of the total in the region, 15.4 per cent of that in private ownership.

3. The Northern Pacific Railroad still owns in western Washington between 300,000 and 400,000 acres of its original grant, mainly timbered, but distant and mountainous, because the road has already parted with the more accessible portions.

4. The grant owned by the Southern Pacific Railway as far as it lies in Oregon and is unsold, consists of about 2,300,000 acres of land bearing 70.5 billion feet of timber.

5. In Washington are some 30 other great holders of timber, who together own towards 1,000,000 acres of timbered

land and an average each of more than one billion feet.

6. In Oregon, three large timber holders own between them 507,034 acres of timbered land and 38 billion feet of timber, while a second group of eight own in the aggregate nearly equal quantities of both.

7. Much was said of the danger likely to arise after the timber was cut, from such extensive ownership of soil.

By way of contributing to a balanced view of this important and complicated subject, attention has already been called to the following considerations:

a. Large solid holdings of timber contribute to economy in operation; consequently, in a competitive industry they tell in the matter of lumber price.

b. Ownership of timber has been shown to involve financial burdens as well as the prospect of profit, and in the present case these are the heavier for the fact that instead of the 20 years' supply usually considered as desirable to be attached to an operation, private ownership took on many times as much.

c. The idea thus arises that monopolistic control of this great natural resource may not be a possibility, that on the other hand, such a system might fall by its own weight.

d. Attention has been called to the bearing on the matter of second growth now coming on or starting, of taxation, and of publicly owned timber, chiefly in the National Forests.

Present Conditions in Oregon

For the purposes of this report comparison has been made for the whole of western Oregon of ownership conditions

at the time the former study was made and for the year 1914 as shown by records kept by the State Forester for the purpose of levying assessments for fire patrol. This comparison affords a survey of the changes in ownership that have occurred meanwhile. On that comparison and other information gathered the following statements and inferences are based:

1. The title of the Southern Pacific Railway Company to its land holding of over 2,000,000 acres has been passed on by the U. S. Supreme Court and in pursuit of its decision action for its restoration to the public is now pending.

2. Of the 11 large holdings comprised in the first two groups, one of the largest has passed into the hands of creditors and promises to be broken into several parts, and not all of the others are considered locally to be in strong financial position; the title of one is clouded; none has been materially increased, although consolidating tracts of small aggregate acreage have been added to several; a large bond issue has been placed on one and considerable tracts have been sold from two others.

3. Among smaller, but still considerable, owners the following movements have occurred:

a. At least one ownership of more than 20,000 acres has been largely sold under compulsion, and the hope of the concern is to close out entirely.

b. In 3 cases considerable ownerships have been consolidated into one, the resultant bodies being from 20-40,000 acres. Of these one is considered in Oregon a weak concern financially.

c. About 8 large operating companies have materially increased their holdings. A number of these are sound, strong concerns. There have also been a number of transfers from holding to operating owners that do not mean increase in the size of properties.

d. About 6 properties running from 9 to 20,000 acres each, along with several smaller ones, were gathered up during the period by people buying to hold as an investment. This movement occurred, however, almost entirely previous to the year 1912. One property of some 15,000 acres was indeed accumulated since. A bond issue to a large amount was floated on it; this was defaulted before a single interest payment had been made; and in October 1915 the property was bought in after foreclosure by the bond holders.

e. There have been several transfers of timber property. In some cases they were made under compulsion and involve serious loss.

4. The general conclusion drawn from this study and other data amassed is that timber buying and the consolidation of property was largely checked by the year 1912. That this check in timber buying is permanent is not, however, to be inferred.* The economics of the situation work for consolidation.

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* In regard to this matter of timber consolidation, recent action of the two states in passing laws regarding rights of way is noteworthy. Previous to 1913, the owner of land whose timber outlet was blocked by that of another was at a marked disadvantage, and that fact played a great part in sharp business practice and the amassing of properties, used by both parties. Laws passed in both states in the year named, afford back holders, who may be small holders, great relief. The main principle is that whoever first puts means of transportation into a territory, if he uses the power of condemnation, must on application haul at a fair price

As bearing on this matter and presenting a local view which is certainly well informed, the following extract from the report of the State Forester of Oregon for 1914 is to the point. It is based on an analysis of timberland ownership in the whole State. Ownership in the sense he uses the term is that of separate individuals or corporations of record, connection through financial alliance not being taken into account.

"Over 16,500 different owners control the 7,981,923 acres of privately owned timber in Oregon, making an average of about 470 acres to each owner. One-third of the timber land of the State is owned in tracts of 640 acres or less, and nearly one-half by individuals or companies having 5,000 acres or less. The balance of a little over one-half the acreage of privately owned timber is in ownerships of over 5,000 acres, and non-resident owners control about one-third of this latter amount. It often happens that even in the case of holdings of considerable size, the number of stockholders makes the individual's interest a comparatively small one. This is not taken into account in figures given. Approximately one-half of the timbered area of the State is in National Forests, and in the case of nearly two million acres title is questionable and in process of adjustment by the courts.

As in other sections the tendency is toward consolidation of holdings into comparatively large tracts. This is generally conceded to be an economic necessity. Cost of operating and first cost of mills, railroads and logging equipment do not as a rule, warrant starting the exploitation of timber unless several years' supply of raw material is assured in advance.

For purposes of economy in operation it is likewise essential that the timber be in a solid block. This being the case the small owner is generally anxious to sell his timber or consolidate with some one else in order that a tract which will prove attractive to a prospective operator may be blocked out. Distribution of lumber likewise requires large organizations,

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the products of the land of another. Dealings from now on will be less hampered, therefore, and it is possible that timber operation may be more dispersed as well.

and the getting of the material to the consumer at a reasonable price demands even greater consolidation along this line than is now in existence.

As shown by statistics on the number of people owning timber, it is apparent that in the face of the economic necessity of blocking holdings, this resource is not in the hands of a few people, as many have been led to believe. Nor does the non-resident owner control the bulk of our timber. Timber land is perhaps the most common form of investment among citizens of the State, and any steps looking to its protection will benefit a very large number as will action penalizing ownership in timber work hardships on a considerable percentage of our citizenship.

It is not thought, however, that so long as the Federal Government controls one-half of the timbered area of the State, and such a large percentage of that of other Western States, that there is any cause of fear of stumpage monopoly or high prices for lumber as a result of large ownership."

Present Conditions in Washington

This State is much further along in its timber history than Oregon; ownership is much firmer, also more concentrated. Of the large owners listed in the former publication the greater number are operating companies. One that until recently has been of another character is now preparing to build several mills in order to realize on its timber. The reason assigned is the weight of taxation.

Changes of ownership in that State between 1909 and 1914 were not systematically studied, but the Forest Service in 1913 for its own purposes did ascertain the changes in ownership within the outside limits of the Olympic National Forest between 1910 and the year named. Previous to 1910, however, there had been a large degree of consolidation.

An examination of the later record shows that eight holders who at the former date owned upwards of 10,000 acres each and an aggregate of 211,110, in the three years added 3,842 acres to their aggregate, less than 2 per cent. There was, however, an increase of 42,610 acres, or 65 per cent, in the area of timber holdings that in the latter year consisted of more than 1,000 acres each and 108,000 in the aggregate.

This region, therefore, somewhat beyond the year 1910 was clearly undergoing the process of timber consolidation. Since then, however, local members of the Forest Service report that it has been checked and state also that during the last 6 years buying has not been general and at liberal prices, but of timber needed for immediate logging, of claims offered at a sacrifice, or such as occupied a strategic location. The reasons assigned for the change in policy are as follows:

a. Opportunity to build up desirable new holdings has been shut off by acquisition of the best, and the key, timber.

b. Fire protection by the State and associated owners has become so efficient that timber men do not feel it necessary to buy out claimants for safety's sake as they did formerly.

c. Taxes have increased 100 per cent since 1908 and timbermen appear willing to let the claim holders carry the burden.

Logged-off Lands--Agricultural

The basic facts in this connection are:- about 150,000 acres of land yearly freed of timber, of which the greater portion is better adapted to continued production of timber than to anything else; large areas of similar land cut off in earlier operations and still remaining uncleared; cost to clear land of stumps and loose material and fit it for agriculture, $100 to $150 an acre as a rule, usually more than the stumpage value of the timber; large areas of land without the above handicap still available, though largely in other regions, from subdivision, or under new irrigation.

Of the stump lands, lumbermen hold a large share, though a share also is held by farmers and other small owners. With lumbermen, cutover lands are a minor interest. In many cases they have been too busy with their major affairs to give them much thought, while a reason that has held in some cases against letting such land out of their control is the fire risk that would be created thereby. They have waited before letting any go until bodies ~~mf~~ were cleared sufficiently large to segregate settlement from standing timber.

Some have had an active policy, however. Several large operators in the region have been noteworthy for encouraging their men to save and locate themselves independently on land; a considerable number of companies have had the definite policy of settling their mill hands on small tracts, thus attaching them to the locality, and the same policy has been

pursued in connection with a few logging operations. Thriving settlements at various points attest the success of these efforts.

On the other hand, there has been manifested on a large scale a disposition to take the "unearned increment" in land value, and that has been stimulated by high prices received from some settlers by expert land-selling organizations. When promoters were known to have sold small tracts at high prices, the possibility of doing the same thing was bound to occur to others;- it was an infectious thing in the conditions of the West. In yielding to it to the extent they have done, lumbermen are believed to have worked against their own interest, for a larger and thriving local population would have furnished the best possible market for the product of their mills.

Logged-off lands have frequently been offered to settlers through real estate men who bought tracts from the logging or lumbering companies, put in roads in some cases, and after subdivision offered the land in small parcels. In these conditions the price for stump land has frequently been $25 to $50 an acre after having been bought from lumbermen at from $5 to $15. The margin, interested parties would justify on the basis of improvements, selling cost, and the right of every man to a profit. Profit, however, legitimate and sustained, seems to attach only to an operation that in itself is sound, while it further appears that cost of selling of a certain type may undermine the soundness of a proposition.

Nor are the evils that attach to the system of deferred payments when ruthlessly worked covered in the statement.

In 1913 a colony of foreigners, who had never seen the land they acquired, were ~~kkkkk~~ brought onto a tract in Washington by skilful promotion. The price to them was $40 an acre, the logging company that formerly owned it having received about $7.50 net. No road entered the tract, nor had anything else been done to improve it, and the men, when they reached the ground and saw the wilderness of stumps and broken logs, are said to have been nearly heartbroken. Grevious wrong had been done to them, and their utmost efforts for years may not repair it. For this the promoter is chiefly responsible, and a picture of him enjoying ill-gotten gains is the only thing needed to complete a symmetrical story. That is not true to the facts, however, for this man himself was playing an unsound game and in it lost his own money and that of his friends'.

Conservative men recognize that clearing land in the region is a task for either the most rugged of pioneering stock or for skilful engineering which has not yet been fully developed as applied to the case in hand. Without one or the other, and good soil and favorable location as well, the fact seems to be that these lands are not economically needed at present.

In contrast with the above occurrence, the action of one of the big timber-owning companies may be related, action just now being taken after considerable thought and experiment.

Having lately completed logging a tract large enough and so situated that it considers its timber safe from fire, this company is now blocking it up for sale in areas of suitable size for farms. The price is set at about $10 per acre; 10 years and six per cent interest are allowed; a man who can deal with the settlers on their own level has been chosen for that work; the intention is to select of those applying only such as promise to make good in the actual conditions.

Nor is this promising movement the only one observable. Present feeling among timber owners may be gathered from the fact that a group of them recently formulated and put up to the Interior Department the proposition that the Government reacquire the cut-over lands of the companies and take charge of the work of placing settlers upon them. The weight of taxation, falling on unproductive land as it does upon timber, no doubt has had a share in promoting activity in these different lines.

Logged-off Lands - Nonagricultural

Logged-off lands with soil not suited to settlement are of very little value to their owners. In a few cases they are grazed; no confidence is felt as yet in growing timber as a private investment, though a good deal will grow up in any case and the situation at large might be otherwise were a yield tax in force. In these circumstances the representative of one great timber owning company speaking to a public body, after stating that more than 50 per cent of the land area of

western Washington is better fitted for forest growing than anything else, and that its productive power for that purpose is greater than that of any other land within the United States, recommended its acquisition by the State in the following terms:

> "I believe that the State of Washington should acquire all of the logged-off areas in the mountainous districts, or in other districts when the land is not adapted to agriculture, and immediately proceed to the growth and development of another forest. The State could acquire this land at a nominal price and, of course, could carry it without the burden of taxation which would confront private ownership. In time this timber would mature and the State would be the owner of all the forests that were left, and could control the price and could maintain the industry by wise and conservative management, which would make it possible for lumbering to be profitable."

The State Forester of Washington remarks in his report for 1914:

> "It is my firm belief that all lands now owned by the State of Washington which are adapted only to the growing of timber should be retained by the State, and that when the timber now standing thereon is sold and removed the land should be reforested, or permitted to reforest itself, which it will do if fire is kept out thereof. Furthermore, it is my opinion that it would prove beneficial, and help to solve the taxation proposition of the future if the State should, in time, acquire all the logged-off lands of the State outside of the National Forests, especially those west of the Cascade Mountains, which are most favorably located and where the soil conditions are the best, and which are suitable only for the growing of timber. No agricultural or grazing lands should be reforested. These nonagricultural lands should be purchased at a very nominal figure, and unless this could be done we would not favor such purchase by the State. Some owners of large tracts of such lands have already signified their willingness to give the same to the State."

On this subject of the logged-off lands a fair statement seems to be that conditions of recent origin have not yet been fully thought out or met; that while trouble has been

experienced and probably is not yet at an end, responsibility for that is diffused, not localized; that monopolization of land by a class that need not be feared. The future of non-agricultural lands in the region is a matter easily within the power of the public to determine, and the whole field open and hospitable to leadership of the right kind.

Stability in Timber Ownership

It has been made clear that timber ownership involves burdens as well as the prospect of profit, and that the former in the fir region have borne heavily in the recent past and promise to do so in the near future. A type of ownership is needed which will give the industry stability at its source, in carrying its raw material, and can at the same time meet public obligations. The problem is the more difficult in connection with the great bodies of reserve timber. A long outlook is required, the viewpoint of investment not of speculation, the thorough knowledge necessary to soundness and comity toward the productive industry, and financial strength which insures a degree of independence from immediate or current returns.

A type of ownership that is stable is then desirable. This in many older sections is sufficiently supplied by ownership dispersed in small properties, and on the West Coast occasional owners in many classes meet the conditions in a measure, none more frequently, perhaps, than farmers and the holders of original claims. On a larger scale, however, under existing conditions, the requirements appear to be met by the properties

of large professional timber holders, and that condition promises to obtain for some time to come. The following considerations rationalize this statement:

a. The large holdings built up by professional timber men were commonly amassed at low prices:- their valuation, therefore, is not boosted by trading as is often the case with weaker and shorter-lived concerns.

b. Quite commonly their own money is involved, so that people at large are not invited by such holders to take the chances of speculation.

c. For the above reasons and because xxxxx such men have counted the cost beforehand, taxes and the cost of protection may be met more easily and readily when these are on an accustomed scale.

d. Toward the operating industry, such holdings may serve a banking function, holding supplies till wanted and at lower rates of return oftentimes than active operators could afford.

e. Such holdings, intelligently managed, may be a stabilizing force in the industry through a strong operating policy or stumpage prices firmly held which are accepted by buyers when times are good and declined in other conditions. The desirability of such stability is pointed out later.

The above considerations have not always been given due weight; nor on the other hand have large timber holdings always been so handled as to serve these offices. Indeed insecurity, demoralization of markets, and treatment of

business and public interests that was selfish and detrimental, have sometimes proceeded from just this source. That does not change the economics of the matter, however. As to the local facts, it is true that certain of the great timber holdings do serve the above purposes, and for that reason, together with their careful regard for private and public obligations, are heartily respected and liked by those who are informed. The sale of timber at fair prices in response to legitimate demand is an established feature of their policy.

To review - the very large timber holding, as far as it measures up to the requirements of strength and stability, serves a real economic need in the conditions of the place and time. But it does not follow that that will be permanent, in respect either to the fact or the need. Particularly when second growth comes to be the chief basis of the industry, the economics of the matter would appear to call for ownership of small or moderate size.

Summary

The first essential for a constructive attitude toward the timber situation in the Northwest is acceptance of accomplished facts and a view of men and conditions that is tolerant and practical. The historical review taken should have promoted that, picturing the acquisition of land and the developments that followed as a general dynamic movement, in more detail, showing how the failure of the laws to meet economic conditions in timbered regions of the West, the

historic attitude of the country toward land ownership, popular land hunger and readiness to accept unearned profits, and finally sequences of the conservation movement, as well as the activities of timber men, contributed to the present state of affairs. To the extent that is now difficult or undesirable, responsibility for it is widely shared.

The public will not feel responsible for the results of rank speculation, nor for men's failure to foresee and correctly allow for important elements that affected their business affairs. It is, however, both locally and generally, concerned for the prosperity of a region and must realize that extensive financial disturbance involves wide circles and is damaging in many ways. More than that, it is interested in the maintenance of the present commercial structure for the following specific reasons:

a. Because public revenue, locally from taxation and generally from the sale of publicly owned timber, is dependent on commercial valuation of timber privately owned.

b. Because sustained protection is largely dependent on the hopefulness of timber owners as to ultimate outcome of their investments.

c. Because a certain scale of lumber prices and stumpage values to correspond, as shown later in this work, are indispensable to the prevention of waste and general good utilization of the natural resource.

If through these considerations a cooperative attitude

on the part of the public is attained, the public justly and without detriment to its own interests can considerably relieve the present situation through moderate and dependable taxation and the feeling of security which a settled policy will give, through better cooperation in protection of timber from fire, through relaxation of the pressure to market timber publicly owned. Two misapprehensions are largely responsible for a mistaken public attitude; first, that timber ownership is uniformly profitable on a large scale; second, that timber can be realized on through manufacture in unlimited annual amounts. The local public particularly should readjust its ideas in both ~~xx~~ connections.

With development of the financial side of timber ownership, a striking situation was disclosed - it was seen how the great natural advantage of the region, its wealth of timber, had been turned, through ~~high~~ capitalization, into its industrial burden. At the same time reasons for the recent fall in timber values and in confidence about timber investments became clear. In connection with this and its outcome accessibility is differentially important. Some timber, already opened up or otherwise accessible, can be realized on before charges accumulate largely. Other bodies, a very great aggregate, must in the nature of the case be held for several decades, so that a difficult question arises as to the balance between holding charges and possible realization.

On this head several things seem to be clear:

(a) That the heavy profits in timber formerly had were

in part artificial, in part conditioned by the low values that then obtained. They are not regularly to be expected from now on.

(b) That timber ownership must at least reduce from a speculative to an investment basis, with rates of return to correspond.

(c) The desirability of a core of ownership of strong, permanent character (which in the circumstances means large ownership) becomes evident.

Equally evident is the fact that the productive industry, which brings to the region means for meeting carrying charges on timber and through which final realization must come, is indispensable to the maintenance of stumpage values, as indeed to willingness and ability to provide fire protection and meet a tax. For that reason among others, maintenance of the efficiency, service, and hopefulness of that industry, its preservation if possible from such slumps as that of the last two years, is a matter of concern to timber owners as well as active operators. A significant fact is that $2.25 per M on the present annual cut is required to pay taxes and the interest and principal payments due on timber bonds, an amount that in some years (See pages to) is not realized outside of cost. Expansion of the volume of production is to be expected and will ease the situation. Both this factor and price levels, however, are limited by the competitive substitution of other materials for lumber.

One more inference in the interest of the public must be drawn - that the present situation creates opportunities for extension of public ownership of timber - producing land and the consequent improvement of producing conditions that are hardly likely to occur again.

PART III - THE PRODUCTIVE INDUSTRY

DIVISION I - LOGGING

Introductory Statement

A TREATISE ON WEST COAST LOGGING WOULD NOT BE APPROPRIATE TO THIS PUBLICATION. CERTAIN MATTERS OF CONSEQUENCE TO THE INDUSTRY, ITS CRITICS, FRIENDS, AND THE PUBLIC, DO, HOWEVER, TURN ON THE ECONOMICS OF THIS BRANCH OF LUMBER PRODUCTION. OF THESE THE CLOSENESS WITH WHICH THE TIMBER STOCK IS UTILIZED IS ONE. THEN THE PRESSURE FOR OVERPRODUCTION CHARACTERISTIC OF THE INDUSTRY IN RECENT YEARS ARISES IN PART FROM THIS SOURCE.

THE CHOICE WAS PRESENTED, THEREFORE, OF OMITTING THIS TOPIC FROM THE TREATMENT, WHICH WOULD LEAVE THE READER WHO MIGHT BE UNFAMILIAR WITH IT TO TAKE SEVERAL IMPORTANT STATEMENTS THAT COME LATER ON FAITH, OR IN THE EFFORT TO ENABLE HIM TO UNDERSTAND THE MATTER FOR HIMSELF, TO COVER THE TOPIC IN A BRIEF AND UNTECHNICAL WAY. THE LATTER ALTERNATIVE HAS BEEN CHOSEN.

AS LOGGING IS THAT BRANCH OF THE PRODUCTIVE INDUSTRY IN WHICH MOST INGENUITY HAS BEEN SHOWN, REAL ROMANCE ATTACHING TO ITS DEVELOPMENT FOR THOSE WHO UNDERSTAND, SOMETHING OF INSIGHT AND SYMPATHY MAY BE GAINED AT THE SAME TIME.

Section 1. - Methods

Logs of the present day, with the exception of a small percentage, must be conveyed several miles overland and some are

hauled for a distance of thirty. The problem of transportation involved fir lumbermen long ago met by the railroad. The railroad line therefore is the central, and a controlling feature of the usual logging operation.

Railroads

Northwestern lumbermen, while adopting the practice of their fellows in other parts of the country in respect to plan of construction, equipment, etc., have had to meet some special problems involved in the character of their country and the size of their timber. Of the devices by which these have been met, incline hoists are perhaps most important and characteristic - tracks laid directly up and down steep grades to connect lines of railway of the usual type but at different levels - thus bringing the rails within reach of new bodies of timber. Up and down these inclines the rolling stock, whether loaded or light, is taken by hoisting engines.

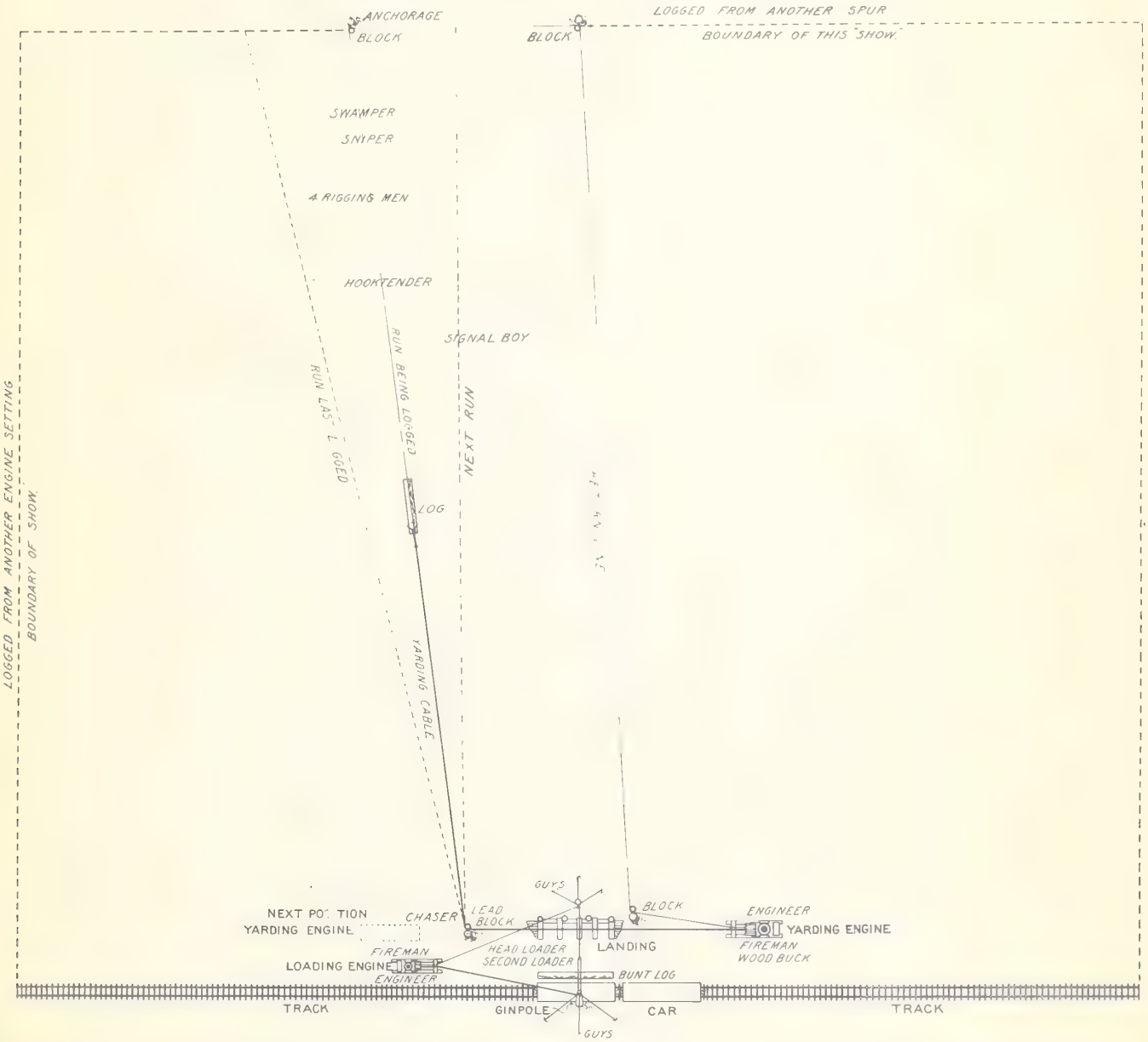
The cost of railroad construction varies widely with the country. On average ground the total labor cost of road-bed, including grade, ballast and track laying, may be set at from $4,000 to $5,000 a mile, and new investment in steel and ties will about duplicate it. A half mile of railroad has, however, cost $70,000, and one tunnel has lately been built on a logging road outletting on the Columbia River which is said to have cost more than $130,000. Railroad construction cost of necessity is greater as operation extends into mountainous country.

The railroad of a single good-sized mill is frequently from five to ten miles long. New cost of construction and equipment for such a plant, hauling 5 or 6 miles and delivering 80 M feet of logs per day, about 20 million yearly, is about $95,000. The plants of some of the big Sound, River, and Harbor logging companies are much larger; the investment requisite is indicated on later pages.

Yarding and Loading

Native power for the stage of log transportation next beyond the railroad is furnished by the logging donkey. This in essentials is a boiler with twin engines and two drums with reverse action, set on an iron frame which in turn is fastened on a sled made of heavy hewed timbers. These donkeys since their first introduction thirty years ago have been increased in size and power until now a type considerably used, with steam cylinders 11 x 13 inches, has a weight, without sled, of 10½ tons and costs at the shop $3,000. These engines move short distances on the ground by their own power, or haul themselves onto cars for longer transportation. 4 wire cable, usually 1½ inches in diameter, is the means through which they apply their power with a 5/8 inch return line to haul cable and chokers outward. An ordinary daily output is 60 to 75 M per machine, with variations for a week's running all the way from 100 M to 1 million; but 438 M has been yarded and put on cars by a regular crew in 10 hours.

DIAGRAM OF AREA LOGGED AT ONE "SIDE", SHOWING RELATIONS OF TRACK, LANDING, ENGINES, LINES AND CREW.



Railway track and logging donkey must stand in right relation to one another. A "landing" so called, is the connecting link, a structure of logs more or less elaborately built, on which the logs stop as brought in by the donkey, across and down which they roll or are slid, to be lifted into the air and deposited on the car that is waiting. A separate engine of small size may be employed for this purpose, or a small drum on the yarding engine. A block or pulley, weighing with its frame 300 to 600 pounds, is fastened some distance in front of the engine and across the landing, serving the needful purpose of bringing the logs always square across the landing. The return line is seldom parallel to the main one for any considerable distance, but is strung through small pulleys round a fan-shaped area, which is logged in successive strips.

Falling and Bucking. West Coast timber is felled by means of saws from 8 to 12 feet long, according to the size of the timber. Two men commonly work together and six trees, 30 M feet, laid on the ground in one working day is a fair product in reasonably good country. It may be considerably exceeded in favorable conditions, and shrinks with rough country and small timber. To fall a single tree, large and leaning badly, occasionally takes more than half a day's labor. After falling, the trees are cut into suitable log lengths by a sufficient number of men called "buckers", using saws and wedges and working singly. Like the falling work, this is a trade in itself, with as many tricks as many another. Older men can

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itself, with as many tricks as many another. Older men can

work at it, who have passed their period of great activity. The line work, on the other hand, is the place for the young and active, also for the development of executive ability, a training ground for future foremen and superintendents.

There is here presented a diagram showing the relation between railway track, donkey, bull block, yarding lines, etc., and on a later page is reproduced part of the topographic map of one of the most progressive companies, with railroad location and donkey settings worked out in advance of actual logging as referred to in the next section.

Section 2 - ECONOMICS OF LOGGING

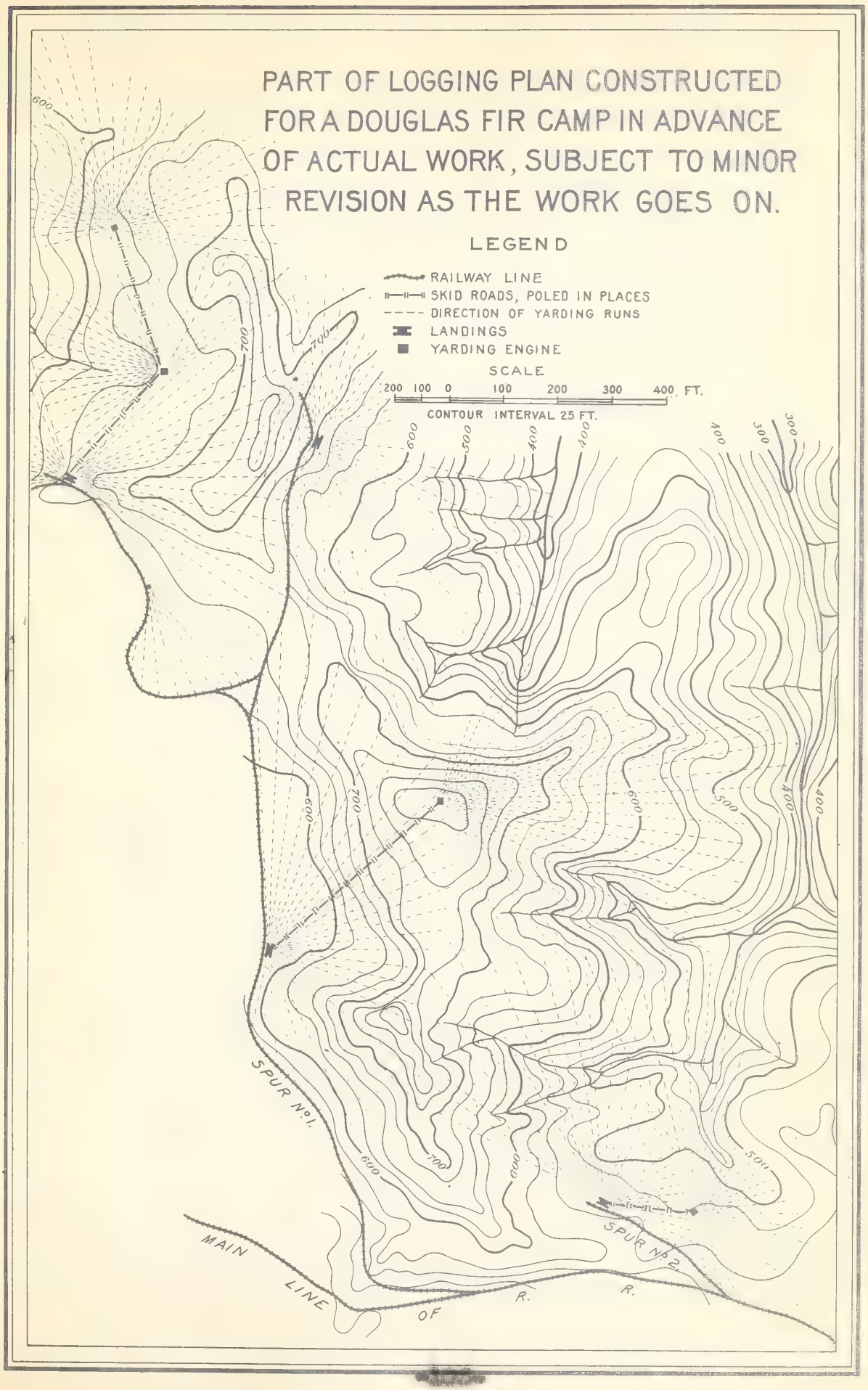
Efficiency of Management

Logging cost will evidently vary with distance to haul and build, and with the nature of the ground. Size of timber and the per cent of defect in it in respect to their effect on cost are taken up in some detail later. Of the complexity of the work enough has been indicated to show that in the nature of the case there must be wide variation in the efficiency of its conduct. The very best of Northwestern camps are under splendid management, such as in fact amounts to, although it does not assume the name of, scientific management. The workmen are chosen with considerable care, encouraged in ambition and promoted in a systematic way so as to increase their efficiency and earning power. With that go detailed accounting with distribution of costs, and a supervisory system

covering, for one thing, promptness and system in making repairs, and in every department organization proceeding upward from the constituent processes through foreman and superintendent and down again - organization to be sure that might not be highly regarded in a department store, but that is adapted to the nature and conditions of the work and the men to be handled. Then behind all current work, in the best managed camps, goes its planning, in advance on engineering principles. These plans include topographic maps of the land, accurate estimates of timber quantities, and the location of railroads and donkey settings. They also set forth the order in which each structure shall be built and each operation performed. The best loggers of the Northwest love their work heartily, and their crews in some cases display the team work and spirit of a football team.

Such organization as that is not, however, within every superintendent's capacity, nor, on the other hand, in fitting into such organization within the range of all available labor. Camps may, in fact, be found in which the spirit is hard or low, the work done from hand to mouth, and that on low standards.

The effect on cost of this matter of efficiency is hard to trace because of other variables. Taken broadly, however, it is considered to amount not uncommonly to $1.00 per M, with occasional wider variation. Numerous cases of change in management have been followed by marked reduction


PART OF LOGGING PLAN CONSTRUCTED FOR A DOUGLAS FIR CAMP IN ADVANCE OF ACTUAL WORK, SUBJECT TO MINOR REVISION AS THE WORK GOES ON.
LEGEND
RAILWAY LINE
SKID ROADS, POLED IN PLACES
DIRECTION OF YARDING RUNS
LANDINGS
YARDING ENGINE
SCALE
200 100 0 100 200 300 400 FT.
CONTOUR INTERVAL 25 FT.
SPUR No. 1.
SPUR No. 2.
MAIN LINE OF R. R.

in cost; also by the opposite occasionally. One case is known in which during two years of new and better management logging cost was reduced from $7 to $4.50 per M. Many factors entered into that, however, including thorough overhauling of the general logging plan and some increase of output.

Labor Cost and Efficiency

Cost varies from one time to another with the wages paid, also with labor efficiency. In the matter of quality of common labor available for the work there has been deterioration since early years, going along with a general increase in wages. This tendency has been broadly offset by the increasing employment of machinery, which, however, could not exert its compensating effect in departments of the operation into which machinery does not enter.

The wages paid often vary at short intervals, with the varying balance between demand for and available supply of labor arising from the condition of the market. At periods in the recent past, characterized by strong demand for lumber, wages have gone up strongly. Similarly, in dull times with subnormal demand they shrink below normal levels. As the industry is now organized wages may be lowered about 15 per cent below the normal standard without serious disarrangement or commotion, and this measure means in the usual job about 40 cents per M. Efficiency, however, complicates these relations. The broad rule in the past has been that restlessness and low efficiency accompany high wages, and vice versa.

in cost; also by the opposite occasionally. No case is known in which during the years of new and better management labor cost was reduced from 4¢ to 2.5¢ per M. Many factors enter into that, however, including thorough overhauling of the general logging plan and some increase of output.

[illegible]

Cost varies from one time to another with the wage paid, also with labor efficiency. In the matter of quality of common labor available for the work there has been deterioration since early years, while there has been a general improvement in [illegible]. This tendency has been broadly offset by the increasing cost of machinery, which, however, could not exert its complete effect in departments of the operation into which machinery does not enter.

The wages paid often vary at short intervals, with the varying balance between demand for and available supply of labor arising from the condition of the market. At periods of the recent past, characterized by strong demand for labor, wages have gone up strongly. Similarly, in dull times with enforced demand they shrink below normal levels. As the industry is now organized wages may be lowered about 15 per cent below the normal standard without serious [illegible] or commotion, and this means more in the usual job about [illegible] cents per M. Efficiency, however, complicates these rules. The broad rule in the past has been that restlessness and [illegible] [illegible], and the [illegible]

The general level and the range of wages are indicated in the following tabulation of certain standard jobs, high and low, which do not greatly vary in pay because of the size of the camp or other special conditions. Against the names are set in the first column what may be looked on as for recent years average or normal wages. From the wages of men who live in the camps, as most do, board, commonly at $5.00 per week, is deducted.

The second column represents, for the same positions, a high line of wages, though not the extreme in all cases. The third column, on the other hand, represents very low wages, some that were found in force at certain camps in Washington during the recent depression. Wages vary to a rather surprising extent among the different camps at the same date in accordance with the location and policy of the different companies.

Position	Range of Wages — Wage per day		
	Normal	High	Low
Head faller	$3.50	$3.75	$3.00
Buckers	3.25	3.50	2.50
Hook tender	5.25	6.00	4.00
Swampers	3.00	3.25	2.25
Signal man	2.75	3.00	2.00
Donkey engineers	3.50	3.75	3.00
" firemen & wood buckers	2.50	2.75	2.00
Head loader	4.25	4.75	3.50
Pump men	2.75	3.00	2.25
Locomotive engineer	4.00	4.50	3.84
Section hands	2.50	2.75	1.65

The general level and the range of wages are in
ted in the following tabulation of certain standard jobs,
and low, which do not greatly vary in pay because of the s
the camp or other special conditions. Against the wages s
ent in the first column that may be looked on as fair ave
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The second column represents, for the same positi
a high line of wages, though not the extreme in all cases.
third column, on the other hand, represents very low wages
which were found in force at certain camps in Washington in
the [illegible] [illegible] [illegible] [illegible] [illegible]
the location and policy of the different companies.

Position	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Donkey engineers	4.50	[illegible]
Fireman & wood bucker	3.50	[illegible]
Head loader	4.00	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Size of Units

The size of the economical unit for logging varies greatly with the circumstances. Railroad investments are not seldom so heavy as to require a very large output in order to be economical, but this may be secured by multiplication of units.

Further than that it is only necessary to note that very small camps, even those with but one machine, may in fit circumstances be most economical. In fact, as low logging costs as any obtained have come from such operations. Such camps, of course, must have a short railroad haul, country not too difficult, and they can best deal with small sized timber. Other than that, main points are in wages and organization. These small camps frequently pay less wages than the large ones - can do so because of their size and isolation. Their management is more direct than that of large camps. If then the man on whom that depends is equal to the task it may be more effective than any other class of management.

Other advantages of the small camp are, as a rule, small investment and light expense in the overhead department. It can, therefore, more easily than the big camp, be shut down in response to market conditions.

Steady Running

The extra cost of shutting down and starting up, and a factor related to that, the cost of idle plant, understood only by the initiated, are factors of great importance, particularly because of their bearing on the matter of over-production.

Considerable cost usually attends a shutdown that is long enough simply to require housing of machinery and to let a crew get dispersed. The new crew may be prompt in assembling, but time is required before the men get hardened up, sifted out, and shaken into jobs to which they are fitted. True, most companies have old hands attached to them, knowing their ways and the ground, who form the backbone of a new crew, but some weeks of costly production, because at a low rate, are usually involved in a shutdown of this kind, and a year's operation broken up by a series of shutdowns is bound to be costly. For instance, from the cost records of a certain Puget Sound camp for a series of years the following is taken:-- one year, broken up by shutdowns, the total cost of logging was $4.98 per M; other years in the same period, characterized by steady work, $3.66 on the average. Other factors than the one may, of course, have contributed.

To two shutdowns in the year, those at the Fourth of July and Christmas, the business has become adjusted, making use of them in part for thorough overhauling of equipment. Labor too has adjusted itself to them; in fact, they were adopted mainly on its account, though in part also because snow and soft ground in some localities make the work costly in the winter season. These regular shutdowns are oftentimes prolonged, utilized to adjust production to varying demand, and it seems not unlikely that in future they will be utilized for that purpose more systematically and largely.

Prolonged shutdowns mean in the first place, as men usually figure, loss of interest on investment, which may in fact be actual expenditure in the form of interest paid on bor-

rowed money; along with that go the minor costs of insurance and taxes. In the second place, deterioration of many kinds goes on,- the rotting of ties and washout of earthwork on railroads, crystallization and rust of rails, locomotives, donkeys, etc., the total loss of worn cable in stock through the same processes, and so on. Then the expense of employing watchmen can seldom be avoided, while there may be a superintendent, foreman or other valued employee whom it would be a hardship or loss to let go. These elements of cost vary a great deal in different circumstances, and have seldom been carefully figured for any, but they are heavy enough to exert on most operators a strong pressure for steady running, and in time of low production the aggregate cost of idle plant is heavy.

The economics of this matter figured as near as might be from the experience of one representative camp, give results as follows:

(a) For seven years previous to 1915, this camp, running seven months time not on the average, with two shutdowns yearly, produced 56 millions per year at a cost per M close to $5.50.

(b) Had the camp, using the same two shutdowns and paying the same wages, run ten months yearly, which is the high limit practically speaking, it would have produced 80 millions at a cost of $5.30.

(c) In 1915, due to lessened demand, the camp ran but four months, producing 32 millions. The total cost, depreciation charged on a yearly, not a per M, basis, was $6.43

In the above cost figures no interest has been charged. This concern, however, has at present to meet an annual interest

charge for indebtedness on equipment, timber and stock, of $24,000. When this is prorated over the above quantities and added to the costs given above, the following figures result:

For (a) above	$5.93
" (b) "	5.60
" (c) "	7.18

The above illustrates the pressure for production in a specific case, due to the economics of logging and the financial organization of the industry, which conditions together with considerable overdevelopment of plant are true also of the region in a broad way. The following brings this out and further illustrates the pressure of dull times on the industry as a whole.

(a) The production of Douglas fir camps and mills has of late been at the rate of about six billions yearly.

(b) The mills in existence could without strain produce eight billions and the camps more than that.

(c) This eight billions could, other things being equal, be produced by the camps using the same equipment at a cost perhaps 20 cents per M less than the present cut, or a saving of $1,600,000.

(d) During the present depression production has been at the rate of about 5½ billions per year and the loss due to deterioration of equipment and expenses which it has been necessary to undergo may be around $2,500,000 or nearly 50 cents per M on the amount cut. No interest has been included in these figures. While, therefore, logging cost for this period, reckoned on the basis of the camps actually producing, would figure up less than

normal because wages have been reduced and because the more costly and less efficient camps are out of the game, this consideration puts a different aspect on the matter. The burden placed on the industry is clear; the waves of price, high as well as low, that are characteristic of the region, are also in a measure explained. As far as overdevelopment is chargeable with these, there is also a good side to be noted, for if there were not a certain amount of this extra capacity, prices would undoubtedly, in times of heavy demand, go higher than they do now.

Relations to Utilization

The costs of a typical mill logging job in western Washington or Oregon, hauling a distance of five miles, may be made up as follows:

Labor	$ 2.95
Materials	.60
Depreciation	.40
General (supervision, taxes, industrial insurance, etc.)...	.30
	$ 4.25

Or, put into a segregation corresponding to the parts of the operation, the same total cost may be made up as follows:

Falling and bucking (labor and supplies)	$ .70
Yarding (labor and supplies)	1.25
Loading.	.20
Spur construction, ...	.50
Railway operation and maintenance (labor and supplies)	.90
General expense, as above.	.30
Depreciation as above	.40
	$ 4.25

The elements of the above cost statement will vary with different conditions and factors. They are assembled here for the

purpose of tracing the connection between cost and utilization.

In the field of log making it may be said in starting that the striking and familiar picture of two men standing high off the ground on springboards, cutting down a great fir tree, can no longer be seen in this region. Men stand on the ground today when they cut their trees down, unless there is some good reason for the other course; and in the case of small timber when under good supervision they bend their backs in the interest of timber economy.

The stumps of the early days, 6 to 12 feet high, yet to be seen in some localities though they have been largely recut in the case of cedar, frequently contained 1 M feet each and as a whole represented oftentimes 15 or 20 per cent of the available timber. This practice was clearly wasteful; it was based on the fact that the butts of large trees are often very shaky or pitchy so that labor put out was liable not to be compensated. The change to more economical utilization was gradual, in response chiefly to increased value of lumber. Cost has been to but a small degree affected.

More serious than stump waste is that involved in timber breakage. Here the faller's art enters, which, though in outline not different from that in other regions, is rendered here a field for the development of special skill by the length and weight of the timber. On steep ground especially, to fall timber safely to itself and the men is a matter not simple. On such slopes to fall uphill is safest for the timber, but it is dangerous for the men, who may be caught in a slide endwise; the

practice, therefore, is not tolerated. The opposite course is easy and safe for the men, but increased breakage is sure to result from it. The suggestion at once arises of falling along the slope, a course which in fact obviates about half the breakage of down-hill falling. The saving is not all that way, for the bucking of logs lying in that fashion is more costly, and unless done with extreme care results in splitting. Beyond that, too, extra expense may be involved in yarding. Guided by the balance between value and cost, practice on this point, though not always studied, is divided.

Most operators in the region are alive and watchful on matters that concern them as strongly as this does. Occasionally special inspectors are employed to look sharply after this branch of the business, and men unskillful in this line of work are not seldom for that reason discharged.

With the yield reduced by breakage, cost per M is increased. The same thing is also true when there is a large percentage of decay in timber. In this case there is a discount on the logs prepared, while much labor may be put out for nothing in the effort not to waste. A big Oregon company, for instance, because of thorough dealing with rotten timber, had a charge for falling and bucking in 1911 of 95 cents per M, nearly 40 per cent greater than the normal above indicated, while as a matter of fact such conditions have run the cost up to over $1 per M. On the other hand, because of the extra cost, other concerns have trusted the judgment of their men, and no doubt in saving expense have left in the woods some merchantable timber.

The outfit employed in the field of yarding has been described briefly. The usual crew with each engine consists of nine men in the woods, with six more at the machine itself and doing the loading. With the donkey in place and lines strung out, the work consists of attaching to each log in its turn a wire rope or "choker," hooking this to the inhaul line through which the power of the engine is applied, and seeing it through to destination, working it as may be by the stumps, rocks, and whatever other obstruction may be met with, taking time also to unhook and pass by at the bull block. Except for return of line and choker the process is finished when the log is unbound at the landing.

The economics of yarding it is necessary to examine in two connections, the size of timber and timber that is partly rotten, for the effect first on cost, and, through that, upon utilization. In a general way the effect is evident. A round trip yarding may take in given conditions 15 minutes. A log of 2,000 feet is easily handled by the engines, may, all things considered, be as cheaply handled as any in proportion to its volume. Very large logs are liable to cause extra trouble and cost in proportion to their contents. A rotten log of the same size will cause as much trouble and yield perhaps half the scale. A small log may haul easier and quicker, though the reverse is often true, and in any case the gain is not in proportion. Thus there is a point below which it is unprofitable to go in either connection. That point in the case of small timber is very different from what it would be in another country with lighter

outfit, less costly to operate.

A keen Columbia River superintendent in a published paper has drawn the following conclusions as to the yield of a particular type of machine when working in logs of different sizes: the figures necessarily will vary in different conditions, but the principle is a sound one:

Approximate yield of yarder per day of 10 hours.

Logs averaging	2000	feet	each	90 M
" "	1500	"	"	67½
" "	1000	"	"	55
" "	500	"	"	32½
" "	250	"	"	22½

The following results of a study embracing time work by a member of the Forest Service are not regarded as exact or authoritative, but method at least is illustrated and the conclusions drawn, compared with actual practice in the industry, are fairly well in line. The upshot of the matter is that with cost to yard and load timber in this particular camp and chance running 90 cents per M (the low line of cost, due to excellent chance and up-to-date devices), the cost for logs of different sizes as the work goes on (a different thing from the cost of yarding logs running that size on the average) is relatively as follows:

Logs of	2 M	feet	$ .42 per M feet
" "	1 M	"	.62 " " "
" "	500	"	.94 " " "
" "	200	"	1.40 " " "
" "	80	"	3.30 " " "
" "	50	"	6.00 " " "

The following incident shows in a striking way how these problems work out in practice and carries the reasoning one step further in that cost is related to value:

A certain Puget Sound camp in the year 1909 backed out of a body of timber running 300 feet per 32 feet log because of a combination of low prices with added cost of operation. The product per machine was so reduced that 50% was added to normal cost of yarding and loading, and the total cost, including $1.00 stumpage on timber already owned and paid for, was reckoned at $6.25 per M. The logs, quality reckoned against prices, brought almost the same amount, and the chance was abandoned. The company reckoned as follows:

Cost --	28.2 M ft. of logs per day @ $6.25	$177.12
Value--	70% @ $5.50, 30% @ $8.00	176.25

The above is loose reckoning, born of confident times and over-abundant resources. Illustrations of present practice given later on show that the same course would not now be followed.

In the case of rotten timber the same considerations hold, while additional ones enter which further complicate the problem. Thus, yarding as a whole is more than normally costly in these conditions because of the extra work required to get the good logs disentangled from those that are worthless. 40 M feet has been scaled up on a single acre of ground of logs too rotten to haul, and these dragged into all sorts of positions in the process of yarding. Then a log of 2 M feet gross scale costs as much to yard if half of it only is saleable as does a perfectly sound one. This cost may be justified in the case of a fine butt

log yielding at the mill lumber that may be sold as flooring. It may not pay if the product is common only. $1.65 per M as against the above noted normal cost of $1.25, has been recorded, wholly or in large part the result of such conditions.

The seriousness of this problem of rotten timber to the logger, and the thoroughness which some display in dealing with it, will be brought out by a record of the logs cut by a purchaser of National Forest timber. Next is given an estimate of logging costs as affected by certain percentages of defect, based on available records and passed on by competent men. Lastly, the cost of a salvaging operation such as in the interest of conservation it would be desirable to conduct in many territories is set in the same way. From the high figures to which these latter costs run it will be seen that not only must profit and stumpage value be extinguished, but in certain conditions labor even would not receive remuneration, unless the price of lumber were to be materially raised. To draw this conclusion as to such operations on a broad scale is not, however, to say that the principle may not occasionally be used, and that to his advantage, in fit circumstances when the operator knows what he is about.

Record of Logs Hauled and Left by a Buyer

of National Forest Stumpage

Logs 33-1/3% sound were under the contract hauled out and scaled at sound contents.

Timber scaled to the company net	8,000 M ft.
Gross scale on same logs	9,500 " "
Cull logs hauled (1000 logs at full scale)	2,000 " "
Estimated left on the ground	1,000 " "
Total amount of timber cut down	12,500 " "

Logging Cost as Affected by Defective Timber

Suppose the cost to log perfectly sound timber		$4.00 per M
Then " " " "	same timber carrying 20% defect will be	4.50 " "
and " " " "	same timber carrying 50% defect	6.00 " "

Cost of Salvaging Old Timber

Cost in conditions similar to above to take the old and over-mature timber scattered over an area, about 1/3 of its total stand,- $7.00 per M

Cost of same operation were this third but one-half sound, 11.50 per M

A Diversion

The worst and the best in this branch of the industry may well be illustrated by examples. Of these the first indicates the value to workman and consumer of management, capital, and the standards of organization maintained by the industry ~~at large~~. Incidentally the story illustrates the bad effects of the unsettled, often unjustified, expectations of profit in the lumber business, which indeed were often made good in the fluid conditions of the region a few years ago, but which form the bane of the legitimate industry today.

In August 1912, three Swedes, all good and experienced workers for wages, got an ambition to log for themselves, and found a settler, a countryman of theirs, with a million and a half of timber located not far from Puget Sound which he was willing to sell to them on credit. They consequently formed a Company and contracted to buy the timber at 75¢ per M, to be paid from the log sales. Their combined capital was $150.

The job was simple. The timber stood at the head of a pond into which it was an easy matter to haul it. Floated across this, the logs must be hauled by another engine and on a pole road, 3/4 of a mile into tide water. The men had performed all the classes of work involved as wage earners. Difficulties would arise only from financial sources or from poor planning.

Their first move was to simplify their own work by contracting the falling and bucking. Next they bought a second-hand logging donkey at an inflated price on the install-

ment plan. This they set up in the timber and used to haul into the pond poles that were required for the skid road. Clearing out for and construction of this road occupied the balance of their time. Aided by a fourth man who joined them through former association, they worked on it four or five months, standing off grocery bills in the neighborhood stores to feed themselves and their families. The sub-contractor was forehanded to the extent of possessing a little ready money. He began work in September, paid his help and living bills as long as his resources lasted, but after some months, with only 800 M of timber down and ready, he too was on a credit basis.

A team was necessary and this was provided by a personal friend again, who on the notes of the company sold them a wagon and pair of horses. Before the finish the wagon was broken up, one horse killed, the other sold, and the purchase was never paid for.

In December the situation was somewhat relieved and some creditors whose continued confidence was indispensable were helped by distribution of a small sum of money realized for piling. The market for logs was good at the time and a mill on the Sound agreed to buy the output of the concern, when ready for delivery, at going prices. Soon afterward also the required second donkey was bought, this again on the installment plan. Working force, however, was so inadequate that logs could not be delivered; credit was stretched beyond the limit with bills for rent, living, and tools long overdue; soon hunger stared the men in the face, and one and

then another gave up and abandoned the enterprise. The two originators of the scheme of necessity stayed with it, but in June of 1913 they had come to the end of their rope and the job was taken over by the mill company. Then a competent man was put in charge, and needed equipment and force given him; the stumpage bill was paid; labor liens settled at a discount; costly mistakes and omissions repaired, and in 45 days the logs were boomed safely in salt water. Their value was ~~largely~~ eaten up by this much of their cost, and they were towed away by night to avoid attachment.

The losses involved in this ill-starred operation are numerous and heavy, and fair inferences to be derived follow their enumeration.

1. Losses to the owners of the machines are not seriously to be deplored as these men were out for profit alone and were men, too, who should be able to protect themselves against wildcat enterprises.

2. Heavy losses were involved to retail dealers of the region about, who are still, though somewhat less, to be blamed for their bad judgment.

3. Losses to the poor men who worked for the company, sold it a team and other supplies, and in one case guaranteed its bills, are heartily regrettable.

4. The men themselves not only lost much time, but morale and self-respect. Their experience culminated in downright suffering for themselves and their families.

5. From the high cost and heavy waste of labor here involved through misdirection, everyone must observe the value to labor

and to the consumer of managerial ability. This makes the workman's labor fruitful to him and it assures that a commodity is supplied at fair cost to the consumer.

6. The utility of capital comes out in the same connection, and that not only because lack of it was one cause of the failure, but by reason of circumstances which have not yet been mentioned. This was a back-handed job at best, bound to be costly because not on a large enough scale. Ten or twelve million feet that stood tributary to the same improvements would have made a cheaper job of it, yielding more margin to distribute somewhere, either to stumpage, to the operators, to workmen, or to the consumer. To handle this safely, however, would have required a capital of $20,000.

The other illustration is of quite a different kind. In October, 1915, there was published in a lumber journal the following record of logging costs, lacking indeed in respect to depreciation and log freight, but a record that as far as it goes and in the conditions is very low. The company concerned comprises some of the most prominent lumbermen of the region, and is well financed and ably managed. The wage scale found in force at this camp is a liberal one. After the cost statement, is given an extract from a letter written by the manager stating his policy toward the men in his employ.

Logging Cost

Tools, oils & miscellaneous supplies,	$ 0.13
Wire rope	0.06
Falling & bucking	0.45
Yard, clearing rights of way & building landings	0.95
Miscel. labor includ. rafting & towing	0.18
Rail. construc., operation & maintenance	0.49
Dumping, rafting & return tow on boomsticks	0.12
Super. Office & other gen. expense	0.15
Sanitation cost	0.08
Interest and discount	0.21
	$ 2.82

"I have always believed that any business, wither public or private, which failed to consider and make allowances for the element of human equation would not be successful. * * * *

I have gone upon the assumption that there is nothing to conceal from the men, that they more cheerfully work for a successful concern that is making good profits, and is not ashamed to say so, than for one that keeps its affairs in the dark. My experience along this line has been very pleasant indeed. We are paying a higher rate of wages than any other logging camp I know of and are doing cheaper logging. Our employees remain with us. We avoid the constant shifting that seems to be common to the Industry. We have about two hundred men on our force."

Section 3. - LOGGING COST; LOG GRADES

Logging Cost

The following statement, taken in connection with the notes appended, is self-explanatory. Average logging cost, it will be understood from the preceding, is a varying and indeterminate matter. More of the cost records behind the table relate to the year 1913 than to any other, but all obtainable data which tended to strengthen the general result of an average and normal cost figure at the time, based on normal wages, were given due weight.

AVERAGE COST OF DELIVERING LOGS FROM TREE TO PUGET SOUND

(Embodying the figures from twenty camps)

OUTPUT (1913) AND INVESTMENT

Percent of total output, (approximate).....	75 per cent
Average year's output per camp.....	45,000,000 feet
Average day's output per camp.....	200,000 feet
Average fixed investment.....	$140,000
Average working capital.....	$35,000
Average labor cost per thousand feet.....	$3.09

COST PER THOUSAND FEET, LOG SCALE

1. Felling and bucking, labor.....	$0.683
2. Woods to car, labor.....	1.259
3. Railroad (spur) and pole road construction, labor.....	.586
4. Train crews, labor.....	.206
5. Dumping and rafting (includes contract work).....	.211
6. Supplies and maintenance (labor and material)..... of railroad, dump and boom.....	.177
7. Supplies and maintenance (labor and material) of equipment, tools, buildings, etc.....	.307
8. Fuel of locomotives, logging engines, shops, etc.....	.239
9. Wire rope.....	.137
10. Depreciation, equipment.....	.24

11. Depreciation mainline railroad grade, boom and buildings		.066
12. Scaling		.049
13. Return of boom sticks		.046
14. Log freight		.882
15. General expense:		
Salaries and commissions	$0.139	
Taxes	.029	
Industrial insurance	.096	
Sundry expenses	.076	.340
Total average cost per M Log scale		$ 5.428

Notes.

This statement does not include the cost of stumpage, interest of any kind, discounts on logs sold, towage to mill, or taxes on standing timber. It is intended here to include only the cost of transforming, transporting, and sorting the logs, taking them to the point of sale for straight loggers.

The classification of costs given in the statement should not be looked on as ideal. It is in fact an expedient. In collecting the data the classification of the companies was followed of necessity; later, in compiling the figures, they were thrown into the best groups that could be made. The main purpose was to arrive at an average total cost figure.

Brief additional explanation seems to be required. This will be clearer for a brief statement of the transportation relations of the camps.

The average haul by railroad to water is twenty-three miles, while four is the minimum. A few of the concerns have their own railroads reaching to point of delivery on the Sound, but most logs are hauled for a longer or shorter distance on common carrier railroads. Items 4, 11, and 14, with others in less degree, are materially affected by this fact, are of doubtful value when taken separately, and comparison of any one camp's cost with the average would have little point.

The term "Salaries" refers to the pay of superintendents, bookkeepers, etc., at main offices detached from the woods. Following the practice of many camps, the pay of foremen, camp bookkeepers and scalers, time keepers and other general help is thrown pro rata into the cost of the major operations, falling and bucking, spur construction, etc., and it is also included in total labor cost.

Item No. 2 includes the labor cost of yarding, roading, loading, moving engines, running out lines, building landings, pumping water, etc.

No. 3 includes the cost of building spur railroads, and the small amount of pole roads employed in this region. In some cases all the railroad used is taken care of under this heading, or as an operating expense. This has the effect of increasing this item above the normal charge and decreasing classification No. 11. Item 3 was a hard cost to take care of for the additional

reason that in some cases the costs from year to year varied greatly due to varying conditions in the "shows", to the time the work was done, and the method of accounting. Where this condition was found it was necessary to use a figure representing the average cost for several years rather than the cost for one year.

No. 5 includes the cost of sorting and rafting the logs, and some of the figures on which the cost was based include the cost of unloading. As a general thing, in fact, the cost of unloading is included. Over one-half of the amount given in the classification was paid to boom companies that do the work at a fixed rate a thousand feet, the balance representing the amount paid to labor by the logging or lumbering companies.

The cost records of 10 camps hauling into Columbia River, treated in the same fashion, give the following results:

Average years' output per camp	40 million
Aver. daily output	150 M
Aver. fixed investment	$256,000
Labor cost per M feet,	3.11

Cost per M feet Log Scale

1.	Felling & bucking, labor,		.70
2.	Woods to car, labor,		1.31
3.	Spur railroad & pole rd. construc. labor,		.46
4.	Train crews, labor,		.24
5.	Dumping and rafting,		.16
6.	Supplies & maintenance (labor & material) of railroad, dump and boom,		.25
7.	Supplies & main. (labor & material) of equipment, tools, etc.		.45
8.	Fuel of locomotives, logging engines & shops		.23
9.	Wire rope		.15
10.	Depreciation of equipment		.28
11.	" of main line r. r. grade, boom and buildings,		.17
12.	Scaling		.05
13.	Return of boom sticks		.07
14.	Log freight		.43
15.	General expense		
	Salaries & commissions	$0.14	
	Taxes	0.05	
	Industrial insurance	0.11	
	Sundry expenses	0.05	.35
	Total average cost per M feet log scale		$5.30

In many respects these two schedules agree quite closely. The main differences are in the items covering transportation. The Puget Sound loggers use common carrier railroads far more than those of the River. The investment of the latter in consequence is heavier.

Costs here included do not deliver logs to the mills, but an additional towing charge is requisite. This as an average for the logs handled on Columbia River, is 50 cents per M or slightly over; as near as can be ascertained, it is 35 cents on Puget Sound. Cost of delivery to the mills in the two localities ($5.78 and $5.80), therefore, as nearly as was ascertained, is almost exactly the same.

A smaller, but still considerable, log market exists at Grays' Harbor on the west coast of Washington; and Willapa Harbor, in the same general region, though its mills for the most part do their own logging, is another main competing point. Costs for a number of representative camps were obtained at both points and the results, for logs at the mill slips, are as follows:

Cost of logs at mill, Gray's Harbor, Wash.	$ 5.75
" " " " " Willapa "	5.78

The very small divergence here found, five cents at the utmost for the four localities, might be made too much of. The number of plants covered, except in the first case, was not sufficient to give the suggested inference firm ground. Then scaling methods are not sufficiently fixed and standardized so that one could be sure that an apparent is also a real result. A wide range of cost is characteristic of each market, $7.00 per

M being close to the highest cost for logs delivered in tidewater.

The figures in each case are based on log scale, not on lumber product. As will be explained in the next division of this report, the difference between the two is in the fir region very variable. These cost figures, it should be repeated, do not include stumpage, interest in any form or profit except as salaries might in some cases embody that. It is the charge for transforming trees into logs and transporting them to points of manufacture on tide waters in Oregon and Washington, labor employed on the ground receiving about two-thirds of the amount.

The cost of logging to nineteen inland mills has also been obtained. Of these mill camps, the output ranges from seven to thirty-seven millions yearly, with an average between twenty-one and twenty-two. The costs found average $4.42 per M feet of lumber produced and sold. The considerable difference between this figure and previous ones is mainly explained by the different bases for the two - the former costs having been based on log scale, the last on lumber product. Accurate comparison for business purposes on the latter basis would involve consideration of the exact dimensions of the lumber produced for rail and water shipment.

Log Grades and Log Quality:

Following are the log grading rules in force on Puget Sound. Those of Columbia River are nearly the same:

No. 1 Logs:

No. 1 logs shall be logs in the lengths of 16 to 32 feet and 30 inches in diameter inside the bark at the small end and logs 34 to 40 feet, 28 inches in diameter inside the bark at the small end and shall be logs which in the judgment of the scaler shall contain at least 50% of the scaled contents in lumber in

the grades of No. 2 Clear and Better.

No. 2 Logs:

No. 2 logs shall be not less than 16 ft. long and having defects which prevent its grading No. 1, but which in the judgment of the scaler will be suitable for the manufacture of lumber principally in the grades of Merchantable and Better.

No. 3 Logs:

No. 3 logs shall be not less than 16 ft. long and having defects which prevent its cutting into higher grades and in the judgment of the scaler will be suitable for the manufacture of Common lumber.

Cull Logs:

Cull logs shall be any logs which in the judgment of the scaler will not cut 33-1/3% of sound timber.

In the Puget Sound market the grades are differently called by some, being known respectively as Flooring, Merchantable and No. 2. The last are the original names, two of the three derived from the characteristic classes of material into which those classes of logs were put.

On Columbia River and Puget Sound, both, there is a Log Scaling and Grading Bureau, a corporation owned by loggers, with a competent man in charge, employing well paid men to scale and grade. This practice replaced individual treatment of log purchases some years ago and the general verdict is that it is very much more satisfactory, that it conduces to greater security of business transactions, also to better utilization of timber as elsewhere explained. In large measure logs in both

markets are sorted out according to quality, each raft being made up of logs of but one grade. Practice in this field varies much, however, in accordance with convenience and the demand of the mills.

Average quality of timber as it appears in the Sound and River log markets can only be approximated. Large camps are operating for both these markets today whose product of fir logs is about 50% No. 2 and 50% No. 3 logs. The highest yield of No. 1 logs from a considerable body of timber is around 30%. About one billion feet of fir scaled by one commercial scaler and grader on the Sound between 1896 and 1914 yielded 18% No. 1's and 35% No. 3's. Six hundred million of fir logs handled by the Puget Sound Log Scaling & Grading Bureau in 1913 and 1914 yielded 15% No. 1's, 54% No. 2's, 31% No. 3's. This is supposed to be representative of the present day Sound log cut. Full transcript of the statistics of the Bureau for the two years will be instructive. The quantity of cull logs was not kept account of.

Kind	Quantity	Average Log	Percentages
Fir No. 1	91,991,160 ft. B.M.	2,835 ft.	15%
" 2	320,725,480 " " "	1,104 "	54
" 3	187,609,830 " " "	565 "	31
Total Fir	600,326,470 " " "	915 "	59
Hemlock	71,560,680 " " "	484 "	7
Spruce	21,864,740 " " "	1,039 "	2
Cedar	310,776,460 " " "	606 "	31*
Miscellaneous	14,842,090 " " "	555 "	1
	1,019,370,440 " " "	746 "	100

* Percentage of cedar too high to represent the cut of the Sound.

DIVISION II

LUMBER MANUFACTURE

INTRODUCTORY STATEMENT

MANUFACTURE ON A LARGE SCALE AND VARIETY IN THE STYLE OF MANUFACTURE ARE CHARACTERISTIC OF THE DOUGLAS FIR REGION; ALSO, FOR A PART OF ITS OUTPUT, COMPLICATION IN THE MANUFACTURING PROCESS. THIS IS IMPORTANT PARTICULARLY BECAUSE IT SERVES TO EXPLAIN PRESENT AND PAST PHENOMENA IN THE COMMERCIAL FIELD - THE COMPLEX FRONT THE INDUSTRY PRESENTS TO ITS CUSTOMERS FOR ONE THING, FOR ANOTHER, HOW FAILURES [illegible] INABILITY TO MEET CURRENT STANDARDS AND MAKE ELABORATIONS OF METHOD MADE NECESSARY BY CHANGES IN MARKETS AND THE NATURE OF THEIR DEMAND.

IN THAT SAME MATTER, TOO, CONSIDERATION SHOWS THAT THE INDUSTRY, HOWEVER SELF-CENTERED IT MAY BE AND HOWEVER [illegible] IN ITS ORGANIZATION, HAS WORKED OUT MUCH THAT IS SERVICEABLE IN THE WAY OF DIVERSITY AND EFFECTIVENESS IN THE USE OF THE NATURAL RESOURCE. THE RELATION OF SUCH USE TO PRICE LEVELS IS DEVELOPED.

ANOTHER MATTER MADE CLEAR IS THE DEGREE OF PRESSURE FOR OVERPRODUCTION WHICH ARISES FROM THIS SOURCE.

Section 1. Methods

The Sawmill

The west coast sawmill, whatever its size, possesses main features common to such structures the country over,--a main or working floor to which the logs are lifted and on which the various manipulations of lumber production are performed, and a space beneath utilized for the transmission of power, and for the placing of machinery collateral to the sawing work. Typically logs are taken from water and brought into the mill at one end; lumber and by-products pass out at the other. Cheapness of operation depends in part on power and the rapidity of constituent operations; in part, also, on speed and freedom of movement from point to point.

Pacific Coast lumber manufacture has been developing along with that of the whole country for sixty years past, but owing to the size and weight of the logs it is necessary to handle some special lines have been followed. The features characteristic of the fir sawmill of the present day are as follows:

1. Heavy construction to stand the racking caused by the movement of the heavy loads. Fourteen inch timbers replace those of twelve inches in pine mills, and the whole frame is more solidly braced and knit together.

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1. Heavy construction to stand the racking caused by
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place those of twelve inches in pine mills, and the whole
frame is more solidly braced and knit together.

2. Heavy machinery for the same reason, and at numerous points equipment of special design. The above facts, other things being equal, make construction somewhat more costly than elsewhere and the same thing is true of repairs and replacement. Wear and tear must be met promptly and effectively, or the life of a mill is shortened.

3. A larger band saw than that employed elsewhere, 60 feet long, 15 inches wide, cutting a kerf of ¼", is the usual "headsaw." In one great new mill a succession of bands one behind the other cut at one movement of the carriage. Double circulars of appropriate size, cutting a kerf of 13/32" commonly, may replace the band, and profitably for some purposes and in some classes of timber. The feed in a fir mill is commonly about 300 feet per minute, slow comparatively because of the width of the required saw cuts.

4. A main principle in the design of large mills is to perform only a small part of the work on the head saw, which is slow in operation and cuts a thick kerf. Frequently the log at that saw is simply broken down into thick "cants" or "flitches." These can then be cut up into final form much more cheaply and with less waste in sawdust by lighter and quicker acting apparatus. The appliances employed for this last purpose include all known varieties - the pony band; band resaws both horizontal and vertical, frequently set up

in an independent transfer circuit; the gang, a cheap and effective instrument where boards in considerable quantity are produced; and the edger which in fir mills frequently opens as wide as 12 inches and with its gang of saws adds materially to the lumber output.

The usual fir sawmill, then, is both extensive and complicated. Its design in fact is a matter of nice planning and adjustment. The plans of one plant that was put into commission in 1914 had the intermittent study of the concern's superintendent for two years, and the services of a trained engineer were also requisitioned. Mill design is not standardized, however, nor can it ever be fully, because of the variety of log material to be handled, also of products into which the same logs may, by reason of location or market considerations, be manufactured.

Finishing Processes

Lumber is shipped in a great variety of forms. A mill on tidewater that ships by water to California, the East Coast, or across the Pacific, sends its output away in the rough mainly and its process of manufacture is therefore comparatively simple; finishing and remanufacture are performed at the point of destination.

But two-thirds of the lumber produced in fir sawmills is shipped by rail inland, and in forms adapted to final

use in construction. That involves sizing in a planer for the bulk of the shipments, and for the finer products working into complicated patterns. Further, as the freight haul involves a cost that approaches the mill value of the lumber, the weight of the shipment is a factor of vast importance both for buyer and producer. Two main lines of further treatment are indicated therefore - the reduction of weight through drying and treatment in the planing mill, furthering the same purpose and giving final shape to the lumber.

Yard room, abundant, well-located, correctly arranged with relation to the mill, the planer, and shipping facilities, equipped with means for power handling in many cases, is the first desideratum. Here the lumber is piled openly for air drying, by assortments of quality and size, and remains in pile several months until by reduction in weight it is suited for shipment.

Another essential feature of the inland mill is the dry kiln; this is of comparatively simple construction in the Douglas fir region. Common lumber for immediate shipment is handled through kilns at some plants, but their chief use is to dry out the finer classes of material as they come from the saw before they are subjected to the finishing process. A certain amount of shed room is required for storage of stock that has been through the kilns. This with the yard serves

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as a reservoir in which excess of production may be stored in dull times, to be drawn on again when orders are more plentiful.

The planing department of an up-to-date Douglas fir mill is one of its most interesting features. It is apt to be roomy and airy in the first place. Then the variety of machines with their adaptation frequently to different classes of work, the high speed secured, the nice calculation exhibited in the division of labor and arrangement of machines and conveyors, give an impression of efficiency at first sight which longer study intensifies. Decidedly, numerous planing and sawmills of the West Coast are good examples of modern business management, and good places to work in.

Types of Mills

In accordance with the raw material and the market to be served, several distinct types of mills exist of which the main ones are as follows:

1. The typical inland mill, located on railroad and shipping inland. It has its own logging railroad and camp, and must manufacture all classes of logs which the timber provides into a great variety of products, which in turn must be distributed over a great range of territory. Yard and sheds, kilns, and a large planing mill form part of the plant. The sawmill has a band head saw and behind that such a combination of resaws, (edger, bands, gang) as suit its timber and its

designed capacity. In this last respect; 125 M in 10 hours is typical, but mills of 100 M capacity with one resaw are in existence and seem thoroughly successful, while there are some larger units. The investment in complete plant built new is about $2,000 per thousand feet of daily output, though there is naturally considerable variation on that point. The newest mills are most costly, guided by the economic principle of reducing operating expense through well planned investment. This means specifically replacement of manual labor by machinery. The new mill has fewer men in it than the old one and their work is lighter.

2. At the other end of the scale is the mill whose process of manufacture is very simple. This may be an inland mill producing timbers mainly, a style of plant which was in extensive use some years ago when the transcontinental railways were building and before steel replaced wood so largely in highway bridges and other structures. Or it may be a mill on tidewater cutting rough lumber for local use, for Alaska or California, or for export. Some of these mills have no kilns whatever, and the yard too has small part in their economy. Some sizing and planing must of necessity be done, but taken as a whole the process of manufacture is simple. It is much less costly than the other in consequence; also investment per M of production is about half as much as in the other type.

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3. The great mills standing on Puget Sound, Columbia River and the Washington harbors stand between the two types above mentioned; also among themselves there is great variety. Some approach the rail mills in elaboration of plant and in the expenditure per M put out. In the case of others, only a quarter or third of the lumber is dressed and an even smaller proportion kiln dried. Large capacity is secured in some cases by having two head saws.

The degree of elaboration in plant and manufacture depends largely on quality of timber, and the fact that mills in this class are located on tidewater with great stocks of logs to choose from, makes assortment and specialization easy. That, in fact, is largely practiced, although many of these mills do saw the product of a camp entire. Others, however, buy high class logs, the yellow fir so widely known, which as far as suitable they finish up into the finer and more valuable fir products, their equipment and organization being suited to its production and sale. Others again specialize on red fir, logs suitable to make export and common lumber, manufacture simply and at great speed, but finish up the minor proportion of better class material which such logs furnish.

Above are the characteristic types of mills now producing the bulk of fir lumber. Each has strong exponents and advocates, and in fact each has the justification of

success behind it. Variety indeed is still greater than that depicted. In particular there are in the region a great many mills that have grown from small to large, added on here and there at one time or another to increase capacity and adapt their product to changing demands. Of these the circular as a head saw is characteristic, and there is often lack of balance and harmony of arrangement. Such plants are makeshifts in a way, and yet they may be effective.

4. A type of mill that must not by any means be omitted from consideration is the small plant cutting small timber, second growth typically.

Mills of this type may be run economically at inland situations in capacities anywhere from 10 to 40 M. In make-up they are simple, much like an eastern circular mill whether stationary or portable, but may have a planer. Their disadvantages arise, first from the fact that the lumber produced is not usually as well manufactured as that of larger plants with more elaborate equipment; second, those small mills are at a disadvantage in selling at a distance as compared with those large enough to afford a selling department. Such mills, however, operate cheaply and represent in relation to output a very small investment. Mills of this type with 20 M daily capacity can be put up new and complete, equipped for several years' work, for about $5,000.

Section 2. Economics of Lumber Manufacture

Complication of Manufacturing Processes

The fact may be illustrated that modern lumber manufacturing is by no means the simple and slip-shod process it is apparently sometimes considered, by reference to some of its complexities.

1. The mere variety in dimension of product required is one thing necessitating care in the selection of logs and in fine setting, which in turn is based on firm and accurate construction. A mill, for instance, may have on hand orders for structural timbers of varied length and cross section. These it must get out of logs suitable in quality and of sizes such as can be cut without waste. At the same time it must not neglect the production of smaller material for stock or current orders, and that in the specific dimensions required. The disposition of each log, in fact, constitutes a problem by itself.

In this matter of dimension, fir mills have more to look out for than others because they cut for markets taking different thicknesses of lumber. The California market and foreign countries take 1 or 2 inch lumber, full when cut in the rough, while in adjustment to the heavy rates of freight on which fir lumber has to be shipped by rail it is sawed thin for inland markets - 1-5/8" for 2" when finished, 1-3/4"as it

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comes from the saw. Some mills cut for both markets simultaneously. The sawyers themselves, who perform this work finally, are men of high skill and training.

From this it is seen how there arises of necessity a wide range in mill overrun, the excess of mill product over log measurement. The fact that some mills are run for speed and cheapness, while others depend for success on a high degree of utilization further explains and accentuates such differences.

2. There are about 40 different patterns, outside of mouldings, into which lumber is commonly worked in the planing mill, and when width and length are considered the number grows into several hundred.

3. Grade combined with form introduces complications, and a mill's work must be nicely adjusted all through the manufacturing process. A tidewater mill buying high class logs, for instance, manufactures them into the following main classes of lumber:

(a) Vertical grain products, flooring, stepping, etc. - finished lumber in which the annual rings outcrop vertically or at an angle not greater than 45° with the face of the piece, a feature which reduces warp and wear to a minimum.

(b) Slash-grain flooring, finish lumber, etc. - that is to say, clear lumber in which the rings run parallel, or nearly

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so, to the face, a line of products now of somewhat less commercial value than the last, in which appearance rather than mechanical properties is the dominant element of value.

(c) Large dimension lumber for foreign shipment, railroad use or similar purpose, a product deriving value from its size combined with such freedom from defect as is required for strength, but not restricted on points that relate to appearance.

(d) Small dimension lumber of grade somewhat similar to the last, a necessary product from logs of all classes, those of high grade as well as others, since not all the material first designed for high-class purposes will meet the requirements.

(e) A modern, well-run mill, cutting logs of this kind, produces commonly 10 or 15 per cent of very knotty, pitchy, seamy or partially rotten lumber, mostly from the hearts of logs, that in earlier times would have been set adrift or burnt. Unless the market is freer than usual, neglect of this material would turn the scale between loss and profit in the operation.

4. If the logs handled furnish products varied in size, finish and quality of material, it is no less true that these products are very widely distributed, and that frequently in limited territories and for specific purposes. That involves a very wide reach in the field of merchandising. The

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fact may be well illustrated in connection with that portion of the output represented by timbers.

(a) The mines of Arizona and New Mexico, reached on a haul by water and rail of some 1,500 miles, are supplied with the timber they require mainly from water front mills in Washington and Oregon. A common price for the material on wharf at point of production is $8 per M. While this is low for any serviceable product the business is of great value to the mills by reason of the quality which passes - knots, splits and pitch all being accepted so long as sufficient strength exists in the piece as a whole. This business is handled by brokers to a yearly volume of about 90 millions.

(b) Material of similar dimensions but of quality about equal to that of a railroad tie, and bringing a corresponding price, is required in large quantities in certain mining districts of Australia. Inland mills have an outlet for a similar class of material in the mines of Utah.

(c) Material for the sills, posts and other parts of ordinary buildings is of somewhat higher grade than the last, but still a "common." Fir mills supply with these products much of the western half of the country. Tidewater mills share with those of the interior in this business, while they have an outlet for material generally similar but of somewhat different and higher specifications in the "merchantable" grade,

in demand in Australia and New Zealand, on the west coast of South America, in South Africa and Europe.

(d) A still finer product as regards all those properties that make for strength is the railroad bridge stringer. It is long, cut to a specified cross-section, and has to stand close inspection. It brings about double the price of the class of material first mentioned.

Enough has been indicated of the complexity of fir manufacture (that might indeed be shown in vastly greater extension) to prove that, in any industry made up of several hundred units, wide variation in efficiency of the work is bound to exist. Efficient manufacture of the usual quality of fir timber means selection of the log for given purposes, study of quality as it opens up, its manipulation so as to yield the products desired in respect to both size and grade, a common understanding and team work on the part of men considerably detached, careful sorting after manufacture is completed. Nor is the work stereotyped and fixed; it shifts from day to day with the demands of the market. Here plainly is abundant field for careful organization and training - abundant room, too, for loss through failure to meet current standards. Further, complexities in the general market situation are suggested when it is understood that what is a main product for one mill may be a side line and of minor importance with another.

Underweights

A big factor in the economy of a modern plant is the matter of drying. This arises from the fact that lumber going by rail takes a freight proportioned to its weight, and the further fact that to reach its markets fir lumber has to be shipped longer distances than that produced in any other section.

The following computation on the cost and gain of air-drying dimension lumber, reduction in weight assumed to be 20 per cent, is illustrative and serves to introduce further consideration of the matter:

COST (Value of material reckoned at $10)

3 Mos. Interest at 6%	$1\frac{1}{2}$%		
3 " Insurance " 3"	3/4"		
Shrinkage	$1\frac{1}{4}$"	$3\frac{1}{2}$%	.35
Extra handling cost to and from pile,			.75
Total per M			$1.10

GAIN

	Green 2,600 lb.	Dry 2,100 lb.	Money Gain
Freight on 15¢ rate	$3.90	$3.15	$ .75
" " 22" "	5.72	4.62	1.10
" " 50" "	13.00	10.50	2.50

In this connection it is noteworthy that the gain from drying is larger the higher the freight rate. The turning point between gain and loss as above reckoned, comes at

22¢, which takes fir lumber to the eastern border of Oregon and Washington. Beyond that point a loss is suffered if the lumber is not fully dried.

Lumber is listed in the schedules at a weight considerably above its dry weight and billed at that price plus freight to the buyer. The difference between freight at the listed and the actual weights is called the "underweight." It is an element in realization not obtained till freight bills are in, but the amount is not seldom as much as a respectable profit.

It is only of late years that the mills have paid close attention to this matter, and not all by any means take full advantage of it at the present time. It involves the maintenance of an adequate and well-assorted stock, and is a point at which shortage of working capital, is frequently evidenced. The following figures from a prominent operator, giving the total underweights had on the shipments of four successive years, about the same in amount, show the gains that have recently been made at this point:

1911	$ 2,000
1912	7,000
1913	16,000
1914	23,000

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[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Utilization and Price

It has been indicated that lumber at most sawmills is carefully sorted and subjected to a high degree of finish. This disposition of lumber products means two things that are of advantage: - First, locally, a greater amount of labor is employed on a given quantity of raw material; second, more varied and higher uses for portions of that material are found. What is especially noteworthy in addition is the fact that such higher use depends on levels of price.

Of the variety of high-class products into which the clear outer portions of fine logs are manufactured, flooring, vertical and slash grain, is a staple. The former sells for the higher price; both sorts are divided into grades by knot and pitch defects. The cost of production, yield by grades, and proportion of waste in machining and the cut-up process have been closely determined at some mills.

If suitable material sold were not manufactured in this form, it would be sold as common lumber, as in fact was the case years ago. Its yield to the mill for present purposes may be taken at $10.50. When such lumber is made into flooring in a large way, the cost put on it over and above that of producing common is about $2.50 per M on the finished product, and the loss in close manufacture may be 15 per cent, which is the same as saying that from 1 M feet of common, only 850

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feet of flooring can be produced. With $23 per M as the average net price of the flooring, cost and returns now stand as follows:

850 feet V. G. Flooring at $23 per M net to mill	$19.55
1 M feet common bringing net to mill	10.50
Value added by further manufacture	9.05
Cost of the process ($2.50 per M on 850')	2.12
Net Gain	$6.93

Relative cost and values being anything like the above, there is no question of the wisdom of the process. On the other hand, there is suggested the loss that arises to a manufacturing plant not equipped to carry out such refined manufacture, or slighting its opportunities in this field. Such disadvantage plants of small size are liable to suffer under, though they obviate it in part by sale of the material rough, to be finished elsewhere.

With finished material of less value the question whether to finish it up or sell it in simple form for common uses may be debatable, and its correct answer turn on the market's being high or low. Slash grain flooring, for instance, is made out of strips edged out of side boards cut as a by-product. These strips are salable at any time as common, and on very low markets are thus largely sold. On better markets, however, they are finished up, and the following computation, that of a Gray's Harbor operator, shows the reason:

	Medium prices	Bottom prices
Value No. 2 and better slash grain flooring	$14.50	$10.50
Value rough slash grain strips	8.00	6.50
Value added by higher manufacture	$ 6.50	$ 4.00
Cost of process, including loss of material	4.00	4.00
Net gain	$ 2.50	$ 0

There are millmen in the Douglas fir region who might not assent to even the approximate correctness of the above figures, whose manufacturing in 1914 and 1915 was highly illustrative of the principle sought to be demonstrated. Owing to its operation, together with a small volume of business to choose from and the press of sheer financial necessity, large quantities of export and common lumber, even railroad ties and mining timbers, were shipped from fir mills in that period which in a time of better prices would have been finished up for the finest uses of which the wood is capable. The principle, moreover, is one of progressive development. The future with the higher prices that are to be expected will see new applications.

Overproduction: Double Shift.

As was the case with logging, a matter of great importance in connection with the economics of the lumber industry is the cost of idle plant and the length of the season's run, or, as the matter more frequently presents itself in

connection with mill operation, the question of operating night shifts. To illustrate this matter it is necessary to bring forward some cost figures. These may be divided into two classes, those incurred directly in proportion to the quantity of lumber handled, and certain more general expenses that do not so vary. In the latter group are two branches, (1) general expense so called with the exception of industrial insurance, and (2) depreciation. These costs for a number of rail mills, brought forward from page _____ are as follows: More than 20 per cent of total manufacturing cost is so involved.

Total Manufacturing Cost			$5,657
General Expense			
Salaries	$.358		
Sundry Expenses	.180		
Fire Insurance	.168		
Taxes	.079	$.785	
Depreciation		.480	1.265

Of these, neither fire insurance nor taxes are ordinarily increased by increasing output, and on the other hand they continue when the plant is shut down. Of salaries of general officers and the expense of an office force the same thing may be literally or approximately true. Doubling the output, therefore, shrinks cost in these departments by approximately half, in this case $.39 per M. Depreciation and repairs add something to the gain, not proportionally because some portions

of a plant wear in proportion to use. Then, as men usually reckon, there is interest on investment. There is thus a material saving in operating cost to be had by night running.

The following was worked out with the owner of a plant well arranged and equipped for the purpose. Salaries of general officers, who were also the owners, were not considered.

Expenses cut in two by night running - taxes, insurance, interest on investment, 3 salaries, work of locomotive crane, yearly	$31,517
Per M on 110 M for 290 days in the year	99¢
Cost if output is doubled	49"
Labor saving by employment of cheaper men on night shift, filing, as engineer, and on repairs	5"
2 extra clerks in office balance against 2 night watchmen dispensed with.	
Reduction of expense as thus derived, per M	54"

There are, however, compensations as follows:

a. The output of a night crew is not usually as large as that of men working by daylight, and they may fail to get as much value out of high grade timber.

b. Yard work is not done to advantage in the night and holding lumber for daylight piling introduces extra cost for handling, or else extra room and equipment.

c. Efficient running of a fir plant involves prompt and efficient repairs, and a mill run double shift may not

of a plant wear in proportion to use. Then, as men usually reason, there is interest on investment. There is thus a material saving in operating cost to be had by night running.

The following was worked out with the owner of a plant well arranged and equipped for the purpose. Salaries of general officers, who were also the owners, were not con-

[illegible].

Expenses out in two by night running -
taxes, insurance, interest on investment, 3
salaries, work of locomotive crane, yearly $21,817

Per M on 110 M for 290 days in the year 39¢

Cost if output is doubled 49"

Labor saving by employment of cheaper men
[illegible]
on repairs 5"

2 extra clerks in office balance against
2 night watchmen dispensed with.

[illegible] derived, per M 54"

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c. [illegible] and efficient repairs, and a mill run double shift may not

have enough idle time to allow it to be kept in condition. Only a few mills in fact are considered capable of standing such treatment.

d. The management is put under strain, and difficulties may arise in selling an increased product to advantage. Far more value is involved at that point than in cost of manufacture.

Running double shift was fairly general in the easy expanding times of former years without much thought about the matter, but the close times that of late have been experienced, and keen study induced, have gradually brought about a definition, and some change, of policy. Practice in the region is now as follows:

a. Inland mills have pretty generally discarded the practice. Some cargo mills have frequently strong reason for it in the necessity of producing in a limited time large orders for water shipment.

b. A few water-front mills were built, and their organization planned, with the idea of running twenty hours daily whenever markets are at all favorable. These plans are not likely to be changed.

On the other hand, certain strong timber-owning mills have concluded definitely that such policy on their part so damages their plants, shrinks their selling efficiency, and tends to overproduction in the region that the single shift is in the long run more advantageous.

have enough idle time to allow it to be kept in condition. Only a few mills in fact are considered capable of standing such treatment.

d. The management is put under strain, and difficulties may arise in selling on increased prices or markups. The more value is involved at that point than in cost of manufacture.

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a. Inland mills have pretty generally discarded the practice. Some cargo mills have frequently strong reason for it in the necessity of producing in a limited time large orders for rush shipment.

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On the other hand, certain strong timber-owning mills have concluded definitely that such policy on their part so damages their lands, shrinks their selling efficiency, was based on conjecture in the earlier days, the single shift is in the long run more advantageous.

c. The reaction of different concerns in the recent period of hard times has been various. Certain plants have shut down entirely or confined themselves to a light output to take care of advantageous business or supply old customers. Others, on the other hand, have pursued a policy the direct reverse. They have run two shifts and in every other way extended their production, in accordance with a general policy of steady running and in the effort to show a profit from month to month. Hard times, in fact, are a material factor in increasing the size of operating units.

d. In general, it appears likely that there will be less double shift work in the future than there has been in the past. That should mean both a steadier market and more careful utilization of timber. Reserve capacity is, however, most cheaply held in this form to serve the purpose of meeting unusual demand, and as an equalizer of prices.

The cost of idle plant is approximated from the same data and considerations. With a third of the mill capacity of the region down for two years, the cost to the industry as a whole of merely idle plant has been enormous. This is a matter not generally understood or credited to the industry, with the exception of its application to labor. Insurance and taxes go on as ever; watchmen are required, and steam must be kept up to prevent deterioration and maintain insurance; some salaried men must be kept, while loss is suffered from the

dispersal of valuable men in the manufacturing department, and more from loss of customers. Then in many cases there arises a problem more immediate and pressing than either, the necessity of meeting interest on borrowed money.

The following examples of cost on certain plants that during the past depression have been shut down demonstrate the pressure for steady running, and give an indication of the burden laid on the industry by a period of depression. Overproduction has this among other forces behind it, and the waves of price that sometimes follow such periods have behind them the push of energies that have been repressed and the natural desire of men to recoup themselves for these losses.

a. Expenses incurred on a mill plant of 27 millions normal capacity during nine months of idleness in 1914 and 1915. The overhead expenses in this case, by reason of special circumstances, are light. After the figures for actual cost are reduced to the yearly basis, the estimated special cost of starting up is added, also interest paid out on borrowed money.

General office salaries and expenses	$3089.58
Superintendent and watchmen at mill	3772.35
Insurance and taxes	2885.91
Maintenance of plant and care of equipment	3007.72
(Extra for depreciation not required)	
Expenses for 9 months	$12755.56
Expense for 1 year in proportion	16007.41
Special cost to start up, estimated	3000.00
Actual cost of year's shut down	$19007.41
Per M on 27 million, normal output	70.4 cents
Interest paid out, on same basis	30.2 "

b. Expenses incurred in 1914, while shut down, by a plant equipped to log and manufacture; normal capacity 15 millions. No attempt was made to estimate depreciation, obsolescence, cost to start up, or lowered efficiency of a new organization.

Taxes	$ 980.92
Fire Insurance	2730.84
Sundries	414.26
Fire fighting	652.65
Salaries	4500.00
Office expense	51.38
Watchmen	1926.67
Barn expense	92.30
	$11349.02

c. Same for a logging and mill plant with normal capacity of 20 million.

Salaries of manager and bookkeeper	$3600
Fire insurance	3034
Taxes	1608
Watchmen	1890
Miscellaneous	3100
	$13232
Interest paid out	7628
Total	$19970

Section 3. Cost of Manufacturing

The period of severity for the lumber industry in the Pacific Northwest which began with the middle of the year 1913 among certain good results that it has had, started pointed inquiry into the cost of lumber manufacture. The fact of existing low prices and small or minus profits was evident; the question

was forced from various directions whether a turning point in the industry had not been reached so that competition was likely, in the nature of things, to be more severe from then on; a generous spirit in the matter seems not to have been lacking in that the question was definitely formulated whether the people were paying a tax for costly and inefficient manufacture of lumber. On these grounds, a movement to compare and study costs was started within the membership of the West Coast Lumber Manufacturers' Association in the summer of 1914, and the purposes of this study were served by falling in with the movement. The plan was to assemble, classify and average detail milling costs for the year 1913. Cooperation of the Forest Service involved checking the figures sent in by examination of the books from which they were taken. In pursuit of this cooperative plan, the cost figures of twenty representative mills ranging in daily output from 60 to 175 M were gathered, half the number being inland mills cutting lumber for rail shipment and half located on tidewater, shipping their product by both rail and water. The figures for the two kinds of mills were made up in separate averages. When submitted to the Lumber Association they were accompanied by the following statement by the representative of the Forest Service.

"Your accountant has noted the difficulties that arise inequitably handling the matter of depreciation, which is not an

actual cost but depends on conditions and must be treated as a matter of judgment. Similar difficulties arise in connection with investment in a plant that is anything but new, while site values present problems of their own. In these matters and in connection, too, with repairs and replacements the principle held to was as near as possible to take each operation in its situation as found, using the operator's own figures and methods unless there were clear reasons for departing therefrom.

"Secondly: Interest on investment in our own business we do not look on as a cost but as an element in profit. We feel that it is a good thing to record the figures gathered under this head, but believe it would be confusing and wrong to have figures which include interest as an element become current under the title of cost figures.

"Third: While the figures represent the facts for what is considered a normal year, we are all aware how widely and under what influences such costs vary. Wages may go up or they may go down, and the same thing holds of supplies. But there is another important element in the matter - cost as affected by management, and by mill arrangement and equipment, and some are of the opinion that in both these respects this region is now entering a period of marked development. We have no idea in regard to these things of setting up a standard of perfection, but must reserve the right to draw such conclusions as

actual cost but depends on conditions and must be treated as [illegible]

tion with investment in a plant that is anything but new, whil[illegible]
able values present problems of their own. In these matters [illegible]
and in connection, too, with repairs and replacements the prin[illegible]
ciple held to was as near as possible to take each operation i[illegible]
its situation as found, using the operator's own figures and [illegible]

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[illegible]

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[illegible]

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[illegible]

to efficiency and cost, present and probable, as all the facts gotten at during the course of our work may clearly justify. The idea of reducing cost and promoting efficiency was one reason why this work was undertaken by the Association."

The two composite statements, for rail and for cargo and rail mills follow:

COMPOSITE STATEMENT OF THE COST OF MANUFACTURING LUMBER

Embodying the figures of 20 mills in Washington and Oregon
For the Year 1913

	All Mills	Rail Mills	Cargo & R'l Mills
Total Cut	691,320,211 ft.	250,253,916 ft.	441,066,295 ft.
Average Cut per Mill	34,566,010 "	25,025,391 "	44,106,629 "
Total Days Run (Including night shifts)	5830.3	2540.5	3289.8
Avg. Days Run per Mill	291.5	254.	329.
Avg. Cut per Day per Mill	118,575 ft.	98,499 ft.	134,076 ft.
Total Number of Men Employed (Day shift only)	3248	1244	2004
Avg. Number Men per Mill (Day shift only)	162	124	200
Avg. Wages per Day	$2.71	$2.76	$2.68
Percentage of Output Surfaced	56%	78%	44%

C O S T

	All Mills		Rail Mills		Cargo & R'l Mills	
Boom Labor	$.068		$ .059		$ .064	
" Repairs & Supplies	.013		.014		.011	
Mill labor	1.448		1.463		1.416	
" Repairs & Supplies	.576		.593		.540	
TOTAL BOOM & MILL		$2.105		$2.129		$2.031
Planer Labor	.488		.590		.395	
" Repairs & Supplies	.121		.124		.087	
Kiln Labor	.181		.192		.162	
" Repairs & Supplies	.016		.019		.011	
TOTAL PLANERS & KILNS		.806		.925		.653
Yard Labor	1.208		1.143		1.112	
" Repairs & Supplies	.175		.113		.181	
TOTAL YARD		1.383		1.256		1.293
TOTAL DIRECT OPERATION		4.294		4.310		3.977
Salaries	.341		.358		.286	
Sundry Expense	.147		.180		.123	
Industrial Insurance	.081		.082		.073	
Fire Insurance	.140		.168		.125	
Taxes	.101		.079		.083	
TOTAL GENERAL EXPENSE		.810		.867		.690
DEPRECIATION		.430		.480		.397
TOTAL MANUFACTURING COST		5.534		5.657		5.064

From what has preceded it should be clear that cargo mills might be split into 2 classes, those with a simpler, and those with a more elaborate, form of manufacture. The cost would vary in correspondence.

A type of manufacture not included in the above statements must not by any means be neglected - the simple manufacture of the mill producing rough, or merely sized lumber, whether on the waterfront or inland. The aggregate output of mills now operating on this plan is not large, but the future, as earlier explained, is sure to see a large development of it.

Available cost figures for this class of mills come from a variety of sources and are not readily classified or segregated. It will suffice to say that for lumber put out direct, without much yard work, they run between $1.50 and $3 per M. In these cost figures as in the others, depreciation of plant, such expenses as insurance and taxes, necessary salaries and office expense, are included, but no interest nor the cost of selling beyond that which is embodied in office expenses. Reasonably steady running also is assumed.

Several observations in connection with these cost figures either have point in the immediate connection or will serve to illustrate what is to follow.

1. Reverting to the segregated cost for rail mills, those in whose operation the interior consumer of lumber is

most concerned, the following inferences were drawn after study of the detail material:

a. The variation in total cost among these mills, when all circumstances are fairly weighed, is not so large but that a fair general level of efficiency may be granted.

b. When the figures for the five smaller mills, averaging 81 M in daily output, were segregated from those of the larger mills with an average 10-hour cut of 120 M the two sets of figures were found not to differ by 5 cents per M, either in main branches of the work or in total cost. Two qualifications must be made, however - first, the smaller mills paid somewhat lower wages than the others; second, since these figures embody cost only, the question is not settled whether the circular saw characteristic of the smaller plants and the less elaborate equipment for finishing which it is possible for such mills to maintain, may, over and above the question of their merchandising relations, have had a material effect on realization.

2. Unusual expense was incurred by some of the mills in the year 1913 for repairs and replacements, causing the cost in that department to run up to an unexpected figure. General observation shows, however, that taken as a whole the industry in this region must in the nature of things incur considerable expense during the next few years in the way of mill improvement and replacement. That the figures are too liberal in this department is therefore at least debatable.

3. The variety in style of manufacture among cargo mills was such that from the cost figures themselves no sharp conclusions as to efficiency can be drawn. Greater variation than in the other class was, however, evident. This on close examination was found to come mainly in the yard and wharf department, a branch of cost not appealing to the uninitiated observer as of much significance, but really forming 20-25% of the total manufacturing cost in large plants. The conclusion was forced that in this branch of their work there was room for improved economy. It seems in fact to be clear, and it is widely admitted, that arrangement promoting the early classification of the sawmills' product and the direct and rapid conveyance of the different assortments to the point of further manufacture or of shipment, is a main factor in sawmill economy.

4. In this connection, a collateral fact, noteworthy because it promotes softness and instability in the market, is that depreciation may be nearly or quite extinguished in two sets of circumstances:

a. Numerous plants on the Sound and River having access to what may reasonably be looked on as a perpetual supply of timber and kept constantly maintained, in one view are not chargeable with depreciation, and that would be the safer view in the case of plants built on appreciating real estate.

b. In the history of the region, plants whose builders failed in business have been sold frequently for a song so that second owners are at an advantage by the amount of competitors'

depreciation. This feature in the situation is as clearly evident now, probably, as it ever was. In July, 1915, for instance, 12 acres of land at Willapa Harbor, Washington, with a mill plant in fair order in the construction of which about $90,000 had been expended, was sold under order of court for $12,000. In a certain manufacturing city on Puget Sound a plant into which $175,000 was put by former owners can be had of the bank that took it over, with the land beneath it, for $25,000 today.

5. Variables in cost that are noteworthy are as follows:

a. The quality of its logs or timber, taking effect in the elaboration of manufacture, is liable to affect the cost figures of any plant from year to year.

b. Another factor, one with which management also is bound up, is labor. Of total manufacturing cost in rail mills, labor applied to direct operations and to repairs constitutes about 70%, labor in the sense here used not including office force or superintendence. A cut of 10 per cent in wages means theoretically a reduction of about 35 cents per M in cost. Practically it may mean more or less according to the temper of labor and the character of the management. Reductions in wages running all the way from 5 to 20 per cent have been general since 1913, and the rule applied to labor, many concerns have also applied to their salaried officers.

This is the effect of slack demand and hard competition. Conversely, it has been the history of this region that with advancing prices for lumber, wages also have advanced; as a rule, too, labor in such times has become more restless and less efficient, introducing marked effects in the cost element.

The following data illustrate this matter. First is given average mill wages (sawmill, handling, planer and filing room) of an Oregon plant for 1912,'13 and '14, and, against that, manufacturing cost without depreciation or overhead; then the ratio between these two figures is given. The low ratio for 1914, a year of business depression (the conclusion has been safeguarded from other directions) prove that the crew worked harder or under better organization.

	1912	1913	1914
Average mill wage	$2.72	$2.86	$2.62
Manufacturing cost	3.85	4.15	3.17
Ratio	1.42	1.45	1.21

c. Mill arrangement and equipment, which have so much to do with cost in a long range way, have also to be allowed for as a source of current variation. Mill design, it was earlier explained, is not fixed and settled by any means. On the other hand, men are continually seeing how their plants can be improved. To illustrate, in 1913 a certain Oregon concern added power and changed the arrangement of its sawmill, investing $30,000, with the result that with six less men

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on the floor the mill increased its daily output of lumber. This instance illustrates history in the region, particularly the increase in the size of producing units. That history has not been uniform, however. There are concerns in existence today, as no doubt there always have been, that would like to make such extensions and changes but can not raise the money to do it.

The above considerations serve to take the matter of manufacturing cost out of the class of things fixed and determined. It is, in fact, fluid, variable from plant to plant and time to time, the resultant of a great variety of elements and forces. In the main, the efficiency of manufacture is without doubt improving. This comes about through the normal push of competition and men's ingenuity. Hard times, however, accelerate the movement as has been illustrated in the last two years, which have been memorable particularly because of numerous and successful efforts for better management and organization. The men who in this period have led the improvements that have taken place, in their concentration and mastery of their plants and working force, are certainly to be admired. They have lived very close to their work, and met hard conditions with ingenuity and courage.

Summary

Outstanding points in the preceding are the difficulty and complexity of lumber manufacture on a large scale, and the wide marketing field with which it is necessary for operators to be familiar. First class ability aided by abundant capital set the standards for the region. As these are not uniformly had, efficiency and business success of all degrees are found.

It was shown further that the economics of manufacture tends to steady running and to increase of output, creating pressure for overproduction and a tendency to operating units of greater size. Another noteworthy point developed was the dependence of varied and high class utilization on levels of price.

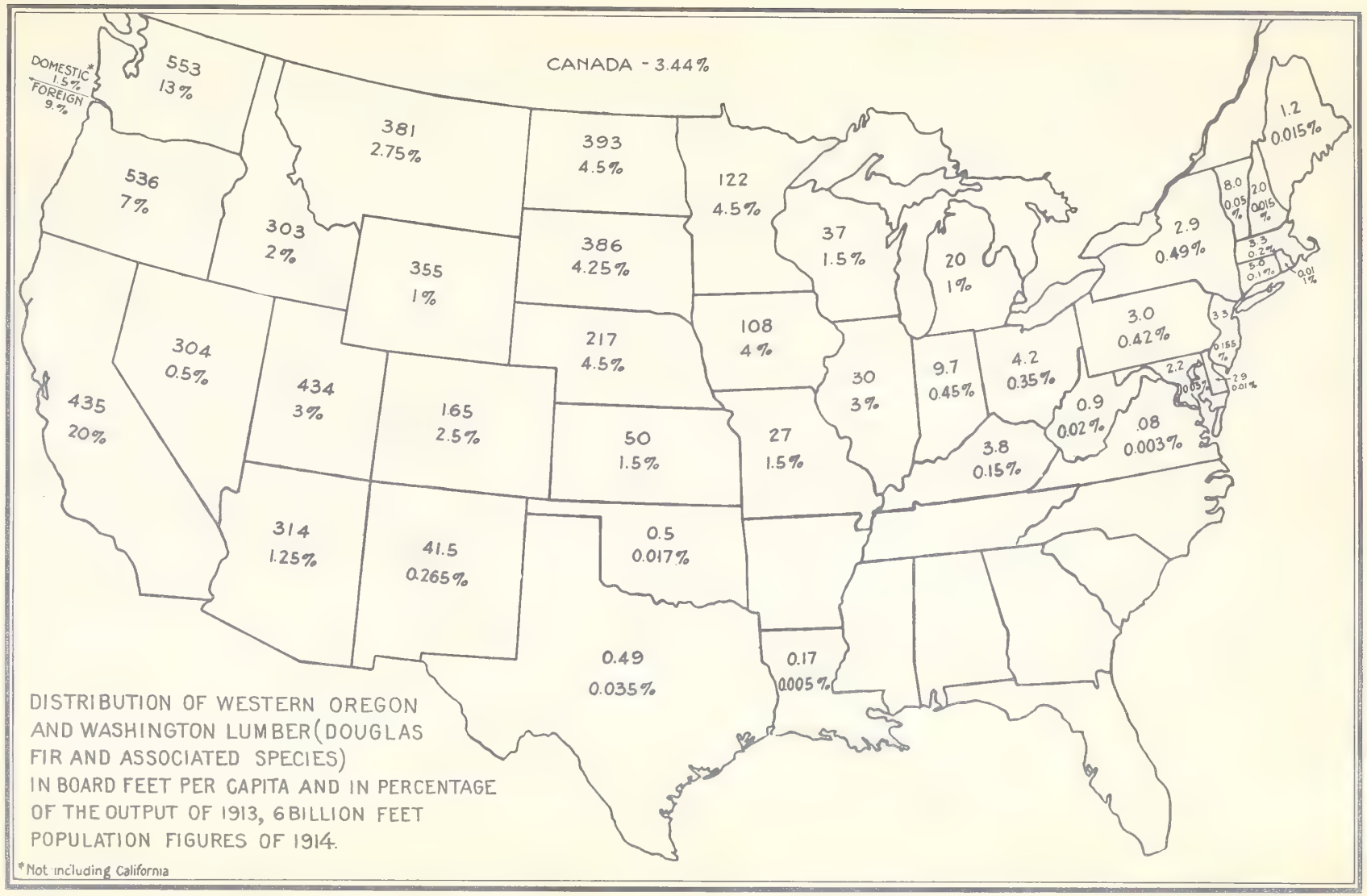
Division III.--DISTRIBUTION AND MERCHANDISING

Section 1.--Distribution

Taking the output of western Oregon and Washington mills at six billion feet of lumber, an amount exceeded only in 1913, the distribution as nearly as can be ascertained, in quantities, percentage of the cut, and per capita of the population of the several States reached, is shown on the accompanying map and tabulation.

Distribution of lumber from mills of western Washington and Oregon previous to opening of Panama Canal. Based on cut of 6 billion feet and shipments of 1913 with minor adjustments.

	Percentage	Lumber--Feet
California	20.00	1,200,000,000
Washington	13.00	780,000,000
Export	9.00	540,000,000
Oregon	7.00	420,000,000
North Dakota	4.50	270,000,000
Nebraska	4.50	270,000,000
Minnesota	4.50	270,000,000
South Dakota	4.25	255,000,000
Iowa	4.00	240,000,000
Canada	3.44	206,400,000
Utah	3.00	180,000,000
Illinois	3.00	180,000,000
Montana	2.75	165,000,000
Colorado	2.50	150,000,000
Idaho	2.00	120,000,000
Alaska and miscellaneous offshore	1.50	90,000,000
Kansas	1.50	90,000,000
Wisconsin	1.50	90,000,000
Missouri	1.50	90,000,000
Arizona	1.25	75,000,000
Wyoming	1.00	60,000,000
Michigan	1.00	60,000,000
Nevada	.50	30,000,000



DISTRIBUTION OF WESTERN OREGON AND WASHINGTON LUMBER (DOUGLAS FIR AND ASSOCIATED SPECIES) IN BOARD FEET PER CAPITA AND IN PERCENTAGE OF THE OUTPUT OF 1913, 6 BILLION FEET POPULATION FIGURES OF 1914.

*Not including California

	Percentage	Lumber-- Feet
New York	.49	29,400,000
Indiana	.45	27,000,000
Pennsylvania	.42	25,200,000
Ohio	.35	21,000,000
Massachusetts	.20	12,000,000
New Jersey	.155	9,300,000
Kentucky	.15	9,000,000
Connecticut	.10	6,000,000
Vermont	.05	3,000,000
Texas	.035	2,100,000
Maryland	.03	1,800,000
West Virginia	.02	1,200,000
Oklahoma	.017	1,020,000
Maine	.015	900,000
New Hampshire	.015	900,000
Delaware	.01	600,000
Louisiana	.005	300,000
Virginia	.003	180,000
Miscellaneous	.293	17,700,000
Totals	100.00	6,000,000,000

*Indicates Alaska shipments and miscellaneous unclassified offshore domestic shipments.

The above data may be condensed into the following:

Destination of Lumber	Per cent of Cut
1. Offshore	10½
2. Canada	3½
3. California, by rail and water	20
4. Consumed in Oregon and Washington	20
5. New England and Middle States with Maryland and Virginia	1½
6. Thence West to the Mississippi River	6½
7. Mountain States (Ida.,Mont.,Wyo.,Nev.,Utah,Colo.)	12
8. Balance (prairie states mainly)	26

In this connection the following points are noteworthy:

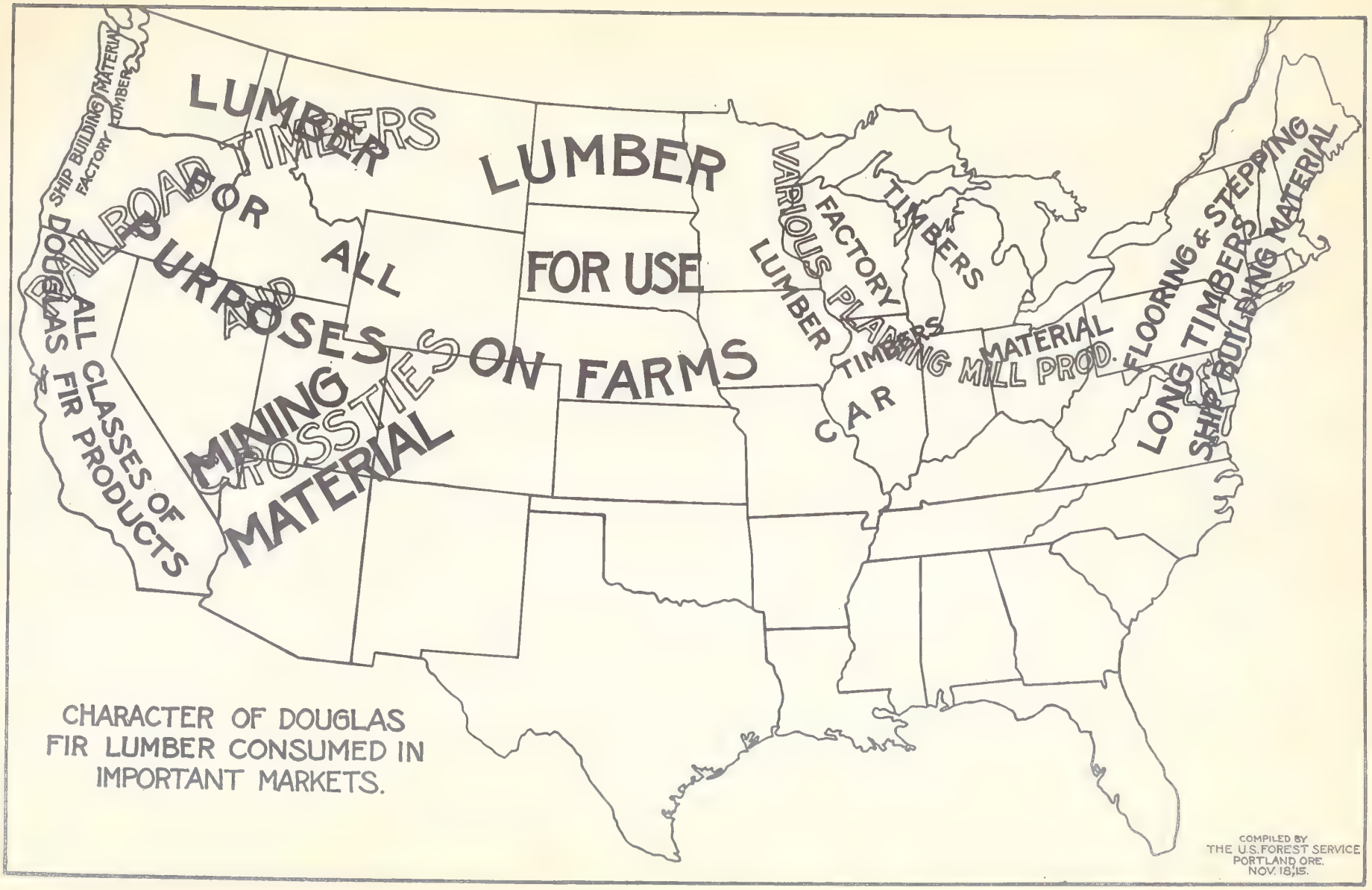
a. Then to the per capita consumption here shown of the States nearest this source of supply, there is added the lumber from the Inland Empire and California consumed by them, their total per capita consumption is found to be considerably larger than that of the United States as a whole (about 575 feet in 1915), due in part no doubt to the fact that they are new countries and yet building up, but also because of the abundance and low price of lumber.

b. Idaho, Utah, Nevada, Wyoming, and the two Dakotas, (Montana is an exception for special reasons) take from this region the greater part of the lumber they use, and Colorado, Nebraska, Iowa and Minnesota a considerable fraction. These States take also a great variety of lumber from other sources.

c. East of the Mississippi River the increasing cost of freight haul tells heavily against fir in competition with southern and eastern lumber. The per capita shipment shrinks strongly, and timbers, factory lumber and finer products only are taken. This and other broad facts as to the character of products shipped to various divisions of the country are indicated in map form.

Freights

Oregon and Washington are so large in area themselves that local freights are about equal to those on lumber between producing and consuming points in New England. From the point



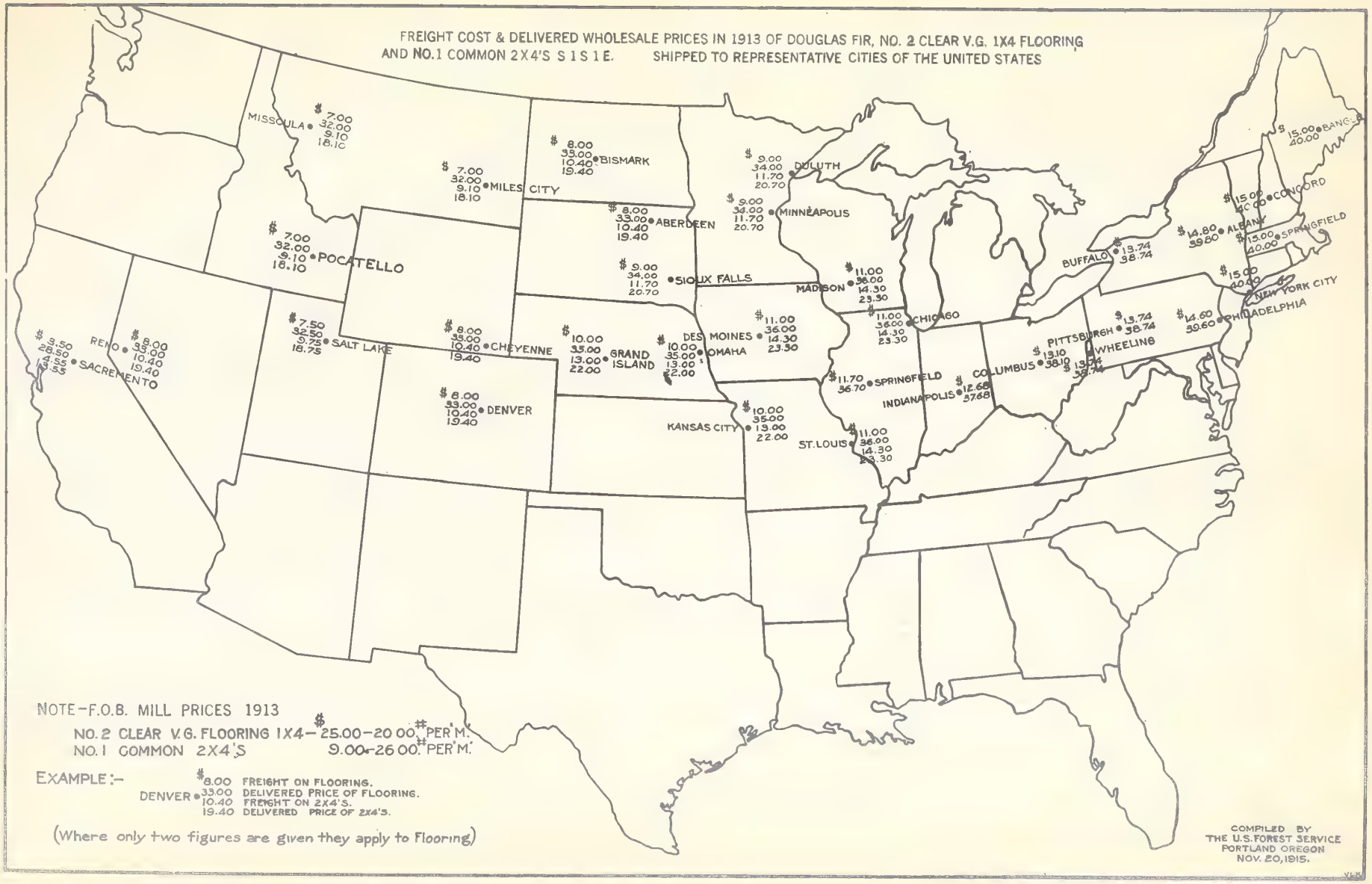
CHARACTER OF DOUGLAS FIR LUMBER CONSUMED IN IMPORTANT MARKETS.

COMPILED BY
THE U.S. FOREST SERVICE
PORTLAND ORE.
NOV. 18, 15.

of origin to the farthest markets reached, on the Atlantic seaboard, the rate is 75 cents per cwt. and the freight cost on light, highly finished products like flooring $15 per M; $24.75 on the list weight of timbers. To Chicago and neighboring points on the 55 cent rate, freight is $11 per M on flooring, and $14.30 on common dimension. Comparable figures for Minnesota points are $9 and $11.70, while the very considerable market at Salt Lake, closely representative of the whole mountain territory, is reached with a cost of $7.50 and $9.78 for the same items. Rail freight on all fir lumber sent outside the area of production (bounded on the east by the Cascade Mountains) averages as near as can be ascertained $8 per M. This is reckoned on list weights. Underweights will reduce the figure by a percentage, but that is perhaps balanced by local differentials which can only be estimated.

The map attached shows the cost of freight haul from the nearest producing point in the fir region to a considerable number of Inland markets. The freight given is in each case reckoned on list weights and the prices are delivered prices corresponding to those that held for a period in 1913. The proportion the freight bears to delivered price is a point of extreme interest to the consuming public, as the same fact is of vital importance to fir producers. In Colorado and the Missouri River markets the freight charge on small dimensions of common lumber about equals the mill price of the article. East of that belt it is so much the greater.

FREIGHT COST & DELIVERED WHOLESALE PRICES IN 1913 OF DOUGLAS FIR, NO. 2 CLEAR V.G. 1X4 FLOORING AND NO. 1 COMMON 2X4'S S 1 S 1 E. SHIPPED TO REPRESENTATIVE CITIES OF THE UNITED STATES



NOTE – F.O.B. MILL PRICES 1913

NO. 2 CLEAR V.G. FLOORING 1X4 – $25.00 – 20.00 #PER M.

NO. 1 COMMON 2X4'S 9.00 – 26.00 #PER M.

EXAMPLE :–

	$8.00	FREIGHT ON FLOORING.
DENVER	33.00	DELIVERED PRICE OF FLOORING.
	10.40	FREIGHT ON 2X4'S.
	19.40	DELIVERED PRICE OF 2X4'S.

(Where only two figures are given they apply to Flooring)

COMPILED BY
THE U.S. FOREST SERVICE
PORTLAND OREGON
NOV. 20, 1915.

Water freight from fir mills to California points, San Francisco and San Pedro chiefly, has ordinarily of late years been at the rate of about $3.50 per M. At the end of the year 1915, however, by reason of conditions arising from the war, it rose to $5.50. In the boom times of 1906 and 1907 freights to San Francisco rose to $10 per M. The water rate for this traffic has been shrunk largely of late years by reason of competition, use of steam, large scale operation, and through improvements in the means of handling.

A noteworthy feature of the lumber trade with California not covered in the above statistics is the towage of cigar-shaped, chain-bound log rafts to San Diego. This form of operation has been successfully carried on for some years by an enterprising Columbia River operator. Each raft contains about 5 million feet of logs which are manufactured into lumber at the point of destination.

The proportion of lumber going offshore to Alaska and across the Pacific, about one-tenth of the whole, is large enough to figure strongly in the economy of the mills. In the following tabulation rates of freight holding in July 1914, approximately those prevailing for some years previous, are compared with the rates of October 1915. The tremendous rise due to war conditions is well illustrated, a rise sufficient to contract the volume of trade largely.

Freight rates North Pacific ports to

	West Coast So. America	Sydney	Melbourne	Great Britain
July 1914	45-s	37-s6d	42-s6d	50-s
Oct. 1915	84-s6d	97-s6d	107-s6d	200-s and up

Variation in Demand

About 60 per cent of the lumber produced is distributed for general use among the people west of the Missouri River, about 12,000,000 in number, with agriculture their chief industry. There is some seasonal variation in demand due to local crop and business conditions, and a dry or unfavorable year, either general or locally, has a considerable effect on the volume called for. As a whole, however, it is a reliable market,--through 1914 and 1915, years of depression for the producing industry, yard trade in most of this region was normal.

Demand from mines and factories is similarly dependent on general and local prosperity, and about as variable as the other.

Railroad demand was in years past a very strong factor in the fir market, and today, with demand from this direction shrunk to a fraction of its former volume, (about one-eighth of the whole output as near as can be told), it still exercises a strong influence. This is because of its irregularity and its time relations. The railroads are prosperous when the country at large is prosperous. At such times they have money to do with, and there is demand for added equipment. On the other hand their

situation physically and in relation to public opinion is such that they can, and as a matter of policy do largely postpone expenditures until indispensable. Their demand, therefore, for car material, for construction lumber, for ties even, is apt to come in on generous markets. It operates, therefore, to emphasize price fluctuations.

Section 2.--Merchandising Methods

Present merchandising arrangements in the Douglas fir region are varied in character, the following being the main features.

1. Inland, the typical arrangement is for each mill to sell its own lumber. That means a sales manager and bill clerks at the home office, one to several salesmen located at strategic points or covering extensive districts in the region from Chicago westward, and men selling on commission located at various distributing centers. The selling is thus by the producer's organization, but mills almost without exception are ready to deal with brokers who bring them advantageous business.

This organization may be, and is, greatly varied. In the first place it varies in force from time to time in accordance with the market. Here again policy is various, as will be gathered from what has been said under the head of manufacture. With dull times and low prices, some concerns relax their efforts or draw entirely out of the market. Others again increase selling

efforts at exactly such periods, while with a market clearly on the up-grade, selling effort is apt to be lightest.

Then there are fir producers who have no salesmen but rely on reputation, a yearly round among customers, and the circulation of lists. One of the largest producers on the Coast follows this policy, having relations with as many as 5,000 retail dealers.

Considerable variation will be found at any time the market is tested in the price at which different items of fir lumber are selling. Much of this is based on the material itself, its quality, inherent or as respects manufacture, which no system of inspection can entirely unify; then some men are better sellers than others. Relative prices on different items currently are also guided largely by stock on hand. When a mill in stock-taking finds one description or dimension in excess or nearly sold out, salesmen are instructed or lists arranged, shifting price on that article by 50 cents or more, with the purpose of checking or promoting sales. At the same time adjustment in manufacturing practice is set on foot. Occasionally, in the best managed operations stock of some item that is dry enough to ship will be entirely out and the question then arises whether to decline business or meet the loss involved in shipping green stock. In October of 1915 a group of Washington mills discovered that they were selling drop siding on very different prices, and finally by a coincidence the stock at fir mills became almost entirely sold out. For a time that article was the strongest fir product on the market.

2. Some years ago the idea of associating mills in selling agencies was devised, a plan which reduced the number of selling units and has in it the possibility of specialization and employing men of more skill. At its inception, the scheme was believed to have great promise, and it has in fact worked to the satisfaction of producers for a considerable number of years in at least one case. That experience has not been uniform, however, and two agencies dissolved at the end of the year 1914. Losses sustained on account of bad handling of credit were one cause, but more telling than that was lack of harmony and insufficient surrender of individual interest among the mill managers. Trained to look strictly after one interest, they would not surrender it here, but made the current interest of their plants, in respect to volume of sales and those kinds of lumber that they might have to sell, paramount over the interest of the group or the market as a whole. There are at present five of these agencies, very diverse in their organization. About 20 per cent of the Inland business is done by them.

3. The middleman or broker is a prominent feature in the industry on the West Coast, as indeed in every lumber producing region. Some years ago the number of wholesalers and commission men was very large indeed. Times were easy, and this was the point in the business where a share in its profits could be had with least capital and application. Many complaints of bad service, of irresponsible dealings, of wrecked producers date from that period.

Of late years the number of brokers has greatly decreased and their responsibility has improved, producers and the banks having cooperated with the reputable men to bring about this result. The hard times of 1914 and 1915 further concentrated the business, to the apparent cheapening of cost and advantage of producer and consumer. In 1913 and 1914 forty per cent of the rail business was done through western brokers. Of the balance of the lumber shipped by rail a large but unknown proportion went through the hands of such men nearer the point of consumption before reaching the retailer or large consumer.

The above system, that through which the producing industry deals with its inland customers, is the product of development not always clearly thought out, not considered efficient from the producer's viewpoint, nor as economical as might be when broadly viewed; in fact, stories are current to the effect that as many as 20 venders of fir lumber have occasionally in the same day called on one buyer. It is true, however, that the aggregate selling cost incurred on fir lumber between mill and retailer is small, vastly less than that involved in many less staple and necessary lines of business.

4. The California water borne business of West Coast mills is handled by offices at San Francisco or San Pedro. These offices are in part the head offices of the producing firms; in part agents employed; in part ship-owning firms owning stock in the mills as well in some cases.

5. Nearly or quite all the lumber sent foreign from Douglas fir mills is sold through brokers toward whom the exporting mills, about 70 in number, have of late years presented a very weak front. It is the field probably in which the producing industry is weakest, present conditions forming a contrast to those of the early years of the industry when the few producing firms owned shipping also and used the sea captains as well as resident agents acting as trade representatives. The subject is handled specifically later.

6. Numerous concerns in the fir region have owned or own retail yards advantageously situated and find an outlet for their lumber in that way. Within a year a movement of that general nature has taken form on a scale that makes it of great importance to the industry as well as to consumers. Early in the year 1915 the Weyerhaeuser interests bought into a large line of retail yards stretching from the mountains to the Mississippi River, which it is their apparent intention to use as outlets for their Coast and Inland Empire mills. This movement is in line with current ideas as to direct and economical selling methods.

DIVISION IV. REALIZATION

Section 1. The Logging Industry

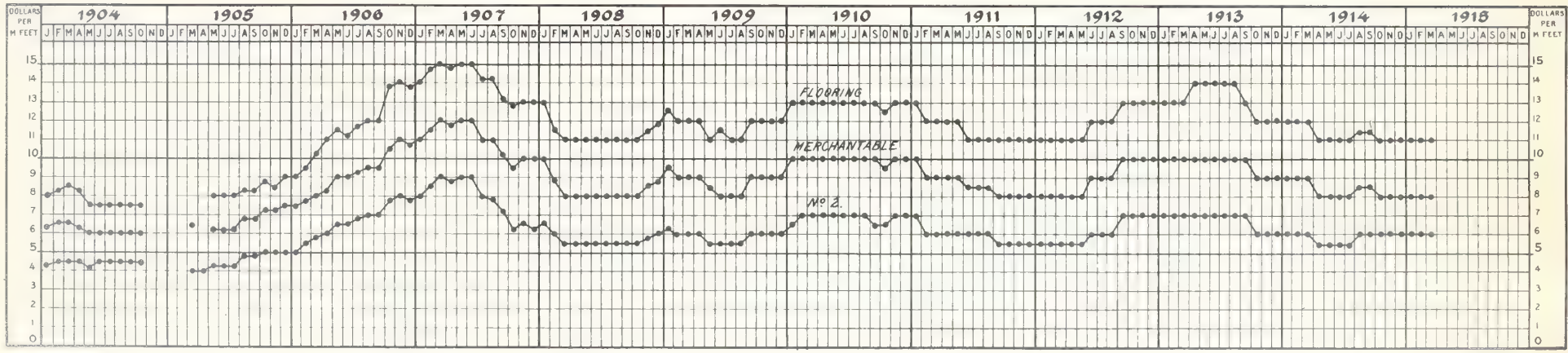
The accompanying curves derived from mill records show the prices paid for fir logs on Puget Sound monthly down to early in the year 1915. The inference is not to be drawn that log prices through the market were uniform at the same time. The prices recorded were paid by certain strong and representative mills to loggers of the same kind. In the ordinary practice of the region, the buyer may take a 2 per cent discount for cash at his option. Extra prices are had for special log sizes, extra long lengths commonly.

A good general idea of realization in this branch of the industry may now be gained by multiplying log prices had for a series of years by the percentages of the different kinds and grades produced, and deducting the cost of logging as given in Div. III. What remains will represent stumpage and profit. In respect to the latter element it may be said that liberal-minded men who have such work to let have been willing in the past to add to the sum of costs computed in advance $.75 to $1.00 per M for the logger's margin. The business is difficult and there is considerable risk in it. The relation of this margin to investment may be gotten at from data previously given.

The following table gives these relations approximately for the log output of Puget Sound

10%	No. 1 fir logs	@	$12	$1.20
20"	cedar logs	@	11	2.20
40" "	2 fir, spruce & Misc.	@	9	3.60
30" "	3 fir & hemlock	@	6	1.80
				$8.80
	Logging cost (See page)			5.43
	Leaving for stumpage and profit,			$ 3.37

PRICES OF FIR LOGS PUGET SOUND 1904 TO 1915.



Section 2.- Realization on Lumber

The price curves opposite, derived from the records of certain strong sellers of lumber in the Puget Sound region, will serve in this and later connections.

Year 1913

The business of the year 1913, considered in the region as the nearest to a normal and wholesome one that had been lately experienced, and lying at hand when the work began, was made the subject of careful study. The following statements bear on its normal character or explain the methods by which the work was done.

a. Average wages for the year were $3 per day in representative camps, and between $2.50 and $2.75 in the mills. The minimum wage for common labor, mainly foreign, was close to $2.25. This looked like a reasonable scale of wages.

b. As respects efficiency, it was thought just and fair to take the industry as it exists and not set up the very highest standards. Improvement can only be made gradually by the industry at large, and some of the economies and reductions in cost that the leading plants secured in the years 1914 and 1915 may not prove to be permanent and desirable viewed from the standpoint of labor. A conservative rule must also be applied to economies reached through improvement in plants. These cannot be made unless the industry through profit secures the means with which to make them.

c. Since the stumpage charge is handled very diversely in their accounting by lumbermen, for the present purpose it had

Section 2.- Tabulation on Charts

The rules curve upwards, derived from the varying of overall hourly wages of labor in the Dyer group values, will serve in this and later connections.

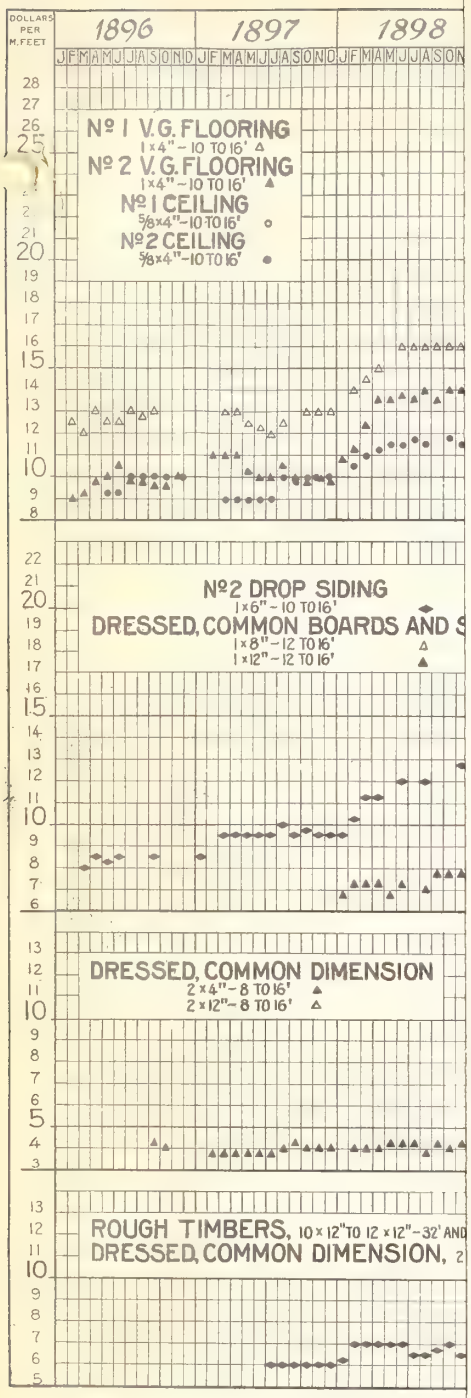
Year 1913

The business of the year 1913, considered in the region as the nearest to a normal and wholesome one that had been lately experienced, and lying at hand when the work began, was made the subject of careful study. The following statements bear on its normal character or explain the methods by which the work was done.

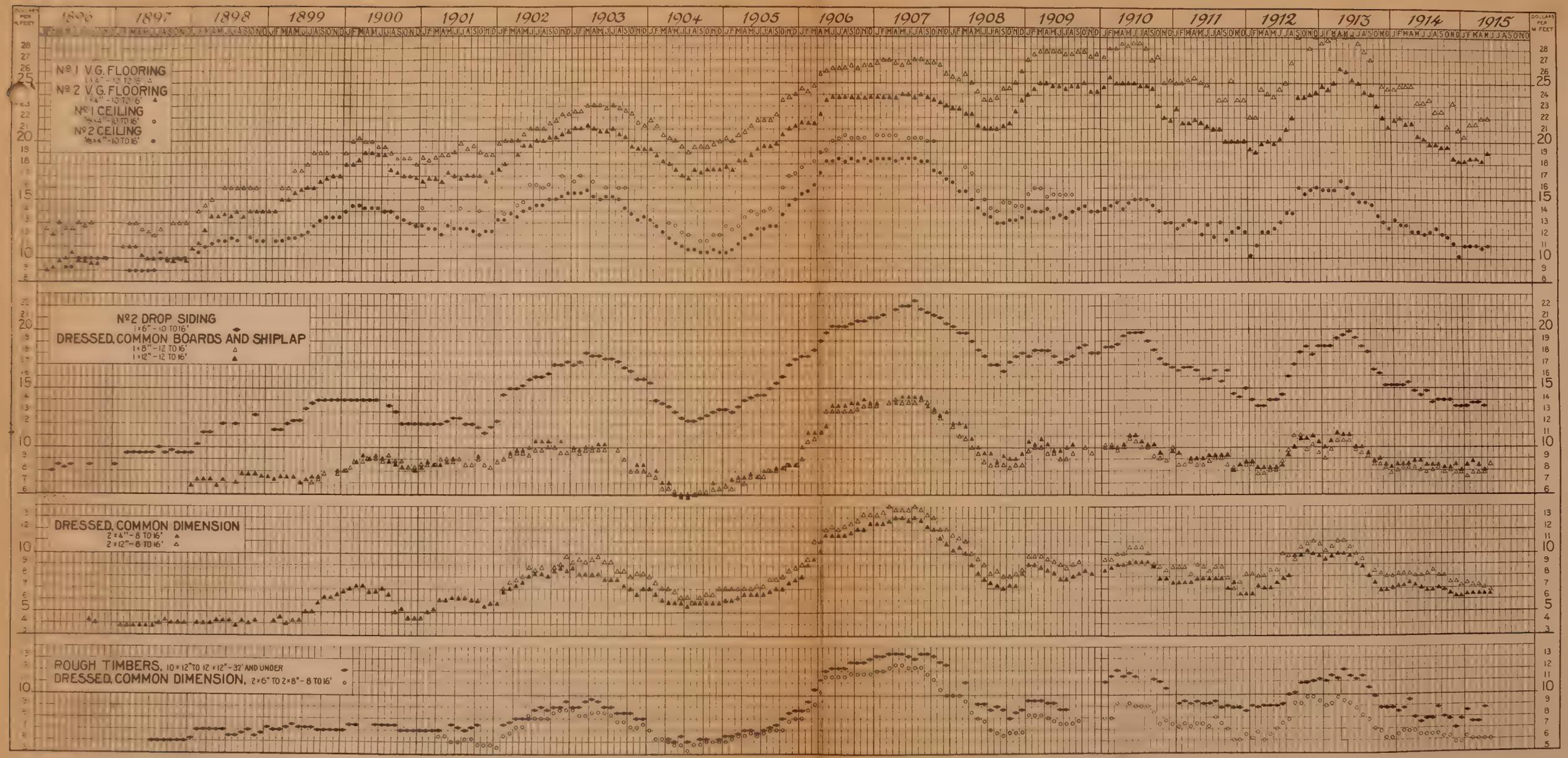
a. Average wages for the year were $3 per day in representative shops, the lowest being $2.00 and $4.75 in the mills. The minimum wage for common labor, mainly foreign, was close to $2.25. This looked like a reasonable scale of wages.

b. As respects efficiency, it was thought just and fair to take the industry as it exists and not set up the very highest standards. Improvement can only be made gradually by the industry at large, and some of the economies and reductions in cost that the leading plants secured in the years 1914 and 1915 may not prove to be permanent and desirable viewed from the standpoint of labor. A conservative rule must also be applied in examining claimed hourly improvement in plants. Some money be made unless the industry through profit secures the means with which to make them.

c. Since the stumpage charge is handled very diversely in Mill accounting by industries, for the present purpose it has


DOLLARS PER M. FEET
1896
1897
1898
JFMAMJJASONDJFMAMJJASONDJFMAMJJASON
Nº 1 V.G. FLOORING
1×4" – 10 TO 16'
Nº 2 V.G. FLOORING
1×4" – 10 TO 16'
Nº 1 CEILING
5/8×4" – 10 TO 16'
Nº 2 CEILING
5/8×4" – 10 TO 16'
Nº2 DROP SIDING
1×6" – 10 TO 16'
DRESSED, COMMON BOARDS AND S
1×8" – 12 TO 16'
1×12" – 12 TO 16'
DRESSED, COMMON DIMENSION
2×4" – 8 TO 16'
2×12" – 8 TO 16'
ROUGH TIMBERS, 10×12" TO 12×12" – 32' AND
DRESSED, COMMON DIMENSION, 2

MOVEMENT OF ACTUAL PRICES OF FIR LUMBER F.O.B. PUGET SOUND, 1896 - 1915



to be treated on principles devised for the occasion. Stumpage in the first place was separated from operating investment; in some cases it was found at rates of purchase from the Government or sanctioned by the Federal Bureau of Internal Revenue; in more cases it was taken at cost worked as a 6 per cent investment. The depreciation charge also was checked, investment against probable life and quantity of timber.

d. The balance of profit, when profit existed, was related in a percentage way to the capital invested in plant taken at depreciated valuation and in active operation.

e. By way of safeguard check was made to ascertain if the costs of the year were subject to any disturbing causes, also of the quality of the timber cut. When it proved desirable and practicable, adjustments on these heads were made on the basis of several years' records. Other checks were made, as of inventory price, stock on hand at beginning and end of the year, etc., with the purpose ~~xx~~ in addition to accuracy of ascertaining for each concern the business results of marketing its timber on 1913's average lumber prices.

f. The business of the year for fifteen concerns of different types and sizes having been gone over in this careful way, the information thus gained was supplemented by much that was taken off the face of operator's records for which extensive facilities were readily afforded.

Of the situation thus disclosed, the most striking feature is the range in what should be for different concerns a satisfactory price level. The varying price paid for stumpage,

to be treated on principles devised for the occasion. Stu
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some cases it was found as rules of purchase from the Gover
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the basis of several years' records. Other checks were ma
as of inventory price, stock on hand at beginning and end o
the year, etc., with the purpose ~~of~~ in addition to accuracy
ascertaining for each concern the business results of market
ing timber on 1919's average lumber prices.

f. The business of the year for fifteen concerns
different types and sizes having been gone over in this ante
way, the information thus gained was supplemented by much th
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sive facilities were readily afforded.

[illegible] the situation thus disclosed, the most striking
feature is the range in what should be for different concern
satisfactory price level. The varying price paid for stumpa

with its quality, is one main factor at the bottom of that; selling ability is another; while a third and very inclusive one, not easy to trace or prove, is economy and efficiency in operation. Then for some concerns, small ones especially, a potent factor oftentimes is a local market.

With the foregoing understood, the following statements summarize conditions in this field of realization:

1. Average billed-out prices received by capable concerns for inland shipments in 1913 were close to $5 off the list for common, No. 2 V. G. flooring brought between $24 and $25, and No. 2 and better dropsiding about $17. The export base for the same period averaged about $12.25. On those prices representative, strong concerns cutting their own timber and running through the year made all the way from moderate losses to 11 per cent profit on their operating capital. $4,063,000 of such capital in eight concerns of varying size earned that year 4 per cent over their stumpage at cost and interest, two losses being represented. The essential facts, averaged, follow; a credit interest account for one concern is included in the profit. Most paid out interest, and that up to 62½¢ per M.

Number of operations,	8
Average production,	27,200 M
Average total investment,	$507,875
Average fixed investment in plants, etc.,	264,463
Average profit,	20,272
Average stumpage,	1.60
Average sale price,	13.20

2. With the fall of prices in the middle of the year, (See page for diagram representing the course of prices) numerous plants of good general reputation closed down, and

have stayed down since, because they could not come out even on the prices in force.

3. There is general agreement that the prices had for about 9 months in 1912 and 1913 are liberal prices; and a good many concerns in fact need them to do business at a profit.

4. Among log-buying mills, the highest profit learned of for the year 1913 was about $2 per M, which represents a liberal percentage on investment; some profit was generally had. But some lost nearly as much as any gained. One concern at a large manufacturing center made a loss of $18,400 in that year on 21 millions of business, and not liking the outlook concluded to close out while it was possible to pay the bills. During six years' business ending in this manner one stockholder drew a salary, but at the close, with no dividends paid meanwhile except in stock, less money was drawn out than was put in at the beginning.

5. The results of two years' business for one of the large, strong concerns in the region, cutting about 50 millions yearly, is illustrative. In 1913, charging to the years' business what was considered safe depreciation on plants and on logging construction in place, while timber tax was charged to stumpage account, an operating profit of $22,000 was made, which is raised to $41,000 when the stumpage charge is reduced to a figure representing cost and 6 per cent interest. The last figure means 3 per cent returned on operating capital. At this point the concern became convinced that one of its mills, some years old but representing yet on its books a

valuation of $72,000, was uneconomical and in the competition of the time could no longer be profitably used. A new plant, costing close to $350,000 was therefore built and put into commission in 1914, which with the remaining plant put on the market the same amount of lumber as the year previous. The results of this year's business were to work the stumpage cut at cost and 6 per cent and earn $5,000 as profit on over $1,000,000 operating investment. But if timber tax is added to cost of operation and depreciation charges, the year actually resulted in loss.

6. The condition of small mills, those of 50 M feet daily capacity and under, was given special attention. In a broad way there has been heavy mortality among these during the last few years, and yet several were found in operation in 1914 and 1915 as successfully as the average. A study made early in 1915 in one district where such mills are numerous, covering 18 plants taken as they were come to, showed one that was solvent and operating, two solvent and shut down, the balance in all stages of failure and dilapidation. The problem of the small mill will be taken up specifically later.

The Years 1914 and 1915

The results of the year 1914 as described for one concern under 5 above are believed to represent closely conditions in the region as a whole - that is to say, stumpage was worked out without profit. This, however, represents great hardship for many. About a third of the capacity of the

region was idle and under heavy expense accordingly, as earlier explained; some concerns were running because only by running could they realize on stumpage and meet their obligations, and there were numerous failures. The concerns that did make money in that year did so by reason of one or more of the following advantages:

a. Cheap stumpage combined with good advantages otherwise. Timber bought at bankrupt sale or at a sacrifice has furnished a share of this cheap stumpage.

b. Very effective operation secured through individual ability and strong finance, improved organization and reduction of wages also playing a part; skillful buying of logs in the case of mills which do no logging; and large output in relation to overhead cost. Several of the mills coming under this head have put out more lumber in these years of depression than they ever did in the same length of time before.

c. Marketing advantage due to local relations, extra ability in the sales department, and having specialities which have sold well.

The following tabulation represents broadly relations between lumber price and the elements which enter into it, based ~~xxxx xxxxxx~~ on the average prices of 1913 and on wages and supply costs of that year, for strong, competent concerns finishing up timber of good quality in comparison with the same data for the period of depression in 1914 and 1915. In the cost figures, some sound and permanent economics reached in the

last-named period are, however, allowed for. Selling price, it will be understood, and cost in a less degree, vary with the quality of the timber. Of the shrinkage in realization sustained, about 75 cents per M is estimated to have come out of labor.

	Normal Condition	Relations in 1915
Logging cost	$4.35	$4.00
Manufacturing and selling cost	5.80	5.40
Stumpage (at cost and interest)	1.60	1.60
10 per cent operating profit	2.00	....
Average price*	$13.75	$11.00

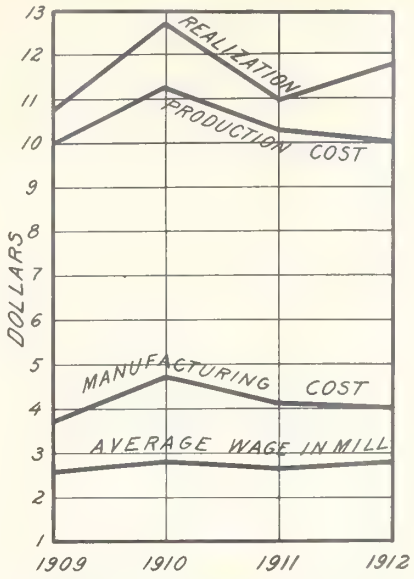
In a similar way, but subject to more variation, the following tabulation represents relations between cost and realization on the same price levels for competent log-buying mills cutting fir logs of average quality:

15%	No.	1	logs	at	$12	$1.80
55"	"	2	"	"	9	4.95
30"	"	3	"	"	6	1.80
	Towage,					.35
						$8.90

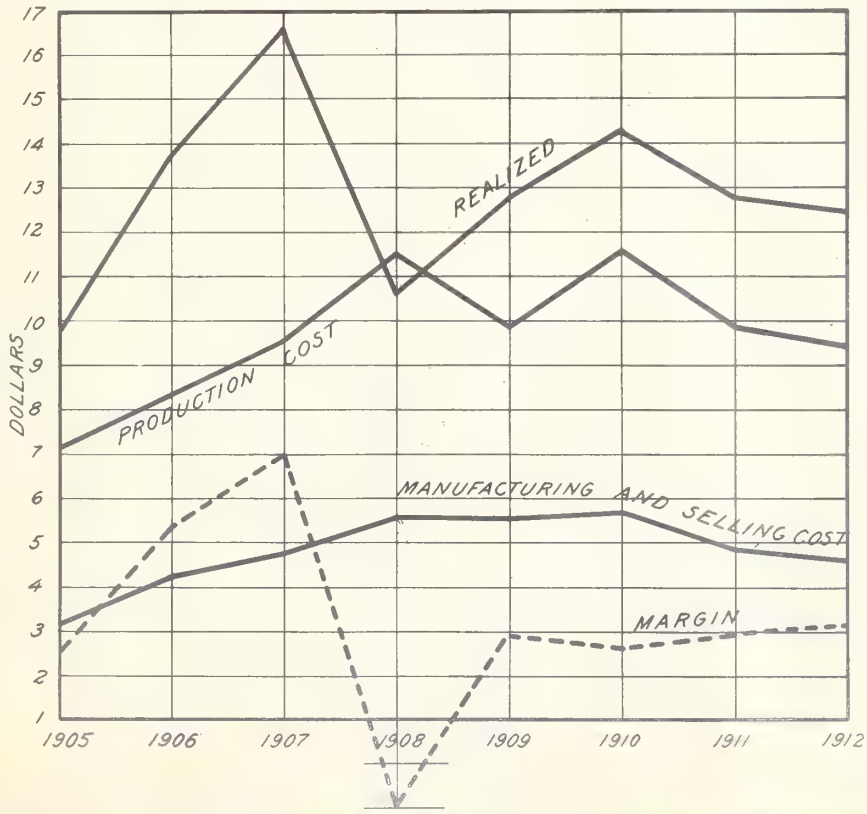
Reduced for discount and overrun	$7.85
Manufacturing and selling cost	5.25
10% operating profit	1.15
Average price*	$14.25

*Note:
Average price means gross price for lumber sold and used, with underweights, claims and discounts adjusted. Receipts for by-products, as wood and lath, are covered in the profit.
Interest paid out not anywhere allowed for.

RECEIPTS FOR LUMBER, PRODUCTION COST, MANUFACTURING COST, AND AVERAGE MILL WAGE OF AN OREGON PLANT 1909-12



REALIZATION, CURRENT PRODUCTION COST AND MANUFACTURING AND SELLING COST OF AN OREGON PLANT 1905 TO 1912. — MARGIN REPRESENTS PLANT DEPRECIATION, STUMPAGE AND PROFIT. COST VARYING WITH PRICE IS CLEARLY SHOWN, BUT RISING COST OF EARLIER YEARS IS DUE IN PART TO INTENSIFICATION OF MANUFACTURE AND SHRINKING COST OF LAST TWO YEARS TO BETTER ORGANIZATION. HIGH COST OF 1908 ALSO IN PART ATTRIBUTABLE TO SMALL OUTPUT.



Previous to 1913

Into realization for years previous to 1913 general insight may be had by tracing back the price curves given on page and comparing with the level of 1913 prices. Judged by this standard 1910 is seen to have been a year of fairly generous realization, prices for the year averaging slightly higher than those of 1913, while 1908, that following the boom, was the least satisfactory.

Into this matter the two diagrams attached will give further insight. They show, for two representative Oregon plants cutting their own timber (a) the net price received for lumber; (b) production cost as a whole exclusive of depreciation; (c) manufacturing cost with general expense added in one case; and (d) in one concern the average of mill wages. The margin between the lines of cost and realization represents plant depreciation, stumpage and profit. This margin itself is in one case platted. On these diagrams and the preceding rests the statement that the years 1908 to 1912 were close years for the industry, years of very moderate realization.

These diagrams give further insight into a matter that was referred to in the parts on Logging and Manufacture---cost varying with realization. Cost is mainly labor, and 1910 particularly was a year of high cost, labor as a whole being restless and inefficient. Rising cost in fact has in the past absorbed a large share of price advances.

Section 5.- Relation of Lumber Prices to General Prices and to Wages.

The first of the two diagrams that follow gives for a tidewater mill in Washington (a) manufacturing and selling cost; (b) cost of logging, manufacture and sale combined, and (c) realization for lumber and lath, yearly, from 1890 to 1909, as ascertained by the U. S. Bureau of Corporations. The margin between b and c stands for the sum of plant depreciation, stumpage and profit; wood sales and mercantile dealings on the side are not, however, represented. The second diagram, mainly derived from the same source but carried on for the present study, relates to another cargo mill in the region, a mill, however, which has always bought its log stock. Realization on lumber and lath and the cost of manufacture and sale are, therefore, represented, the margin between the two standing for the sum of depreciation, log cost and profit.

From these diagrams the following observations are derived:

1. The average selling price of the second mill was higher in 1883 than it has ever been since, 1907 not excepted. Accident might account for that in part, but the industry was clearly in a strong position and general business and financial conditions were favorable in the region and its natural markets for several years at that time.

2. From then on to 1897, the prices had for lumber shrunk steadily (the fact shows on both diagrams) and reached in the year last named the surprisingly low figure of about $6. That this period involved some severe years for the lumber industry is clear from the first diagram, on which for the years 1893 to 1895 the line representing prices had is below the cost line. Those years, as in fact is well known, were very difficult ones for business in the country at large. In this region men remember clearly yet how hard it was to make the ends meet and what measures were necessary to distribute available work among the dependent population. Only in 1899 did the region fairly start to react from its business depression.

3. Noteworthy in addition is the small return to labor in the height of the period of depression, a fact which may be inferred from the cost line. Variation in the style of manufacture might have had something to do with low cost, but clearly labor had a small return in money, apparently not over half what it received in both earlier and later periods.

4. To sum up the above is to say that in a period of years of which the critical and turning one was 1897, both labor and the products of the lumber industry brought less in money than they have at any period before or since as far as shown by the records.

The phenomena above noted are in a general way parallel with those of other industries in the country at large; the cause clearly was a general one, and by economic writers

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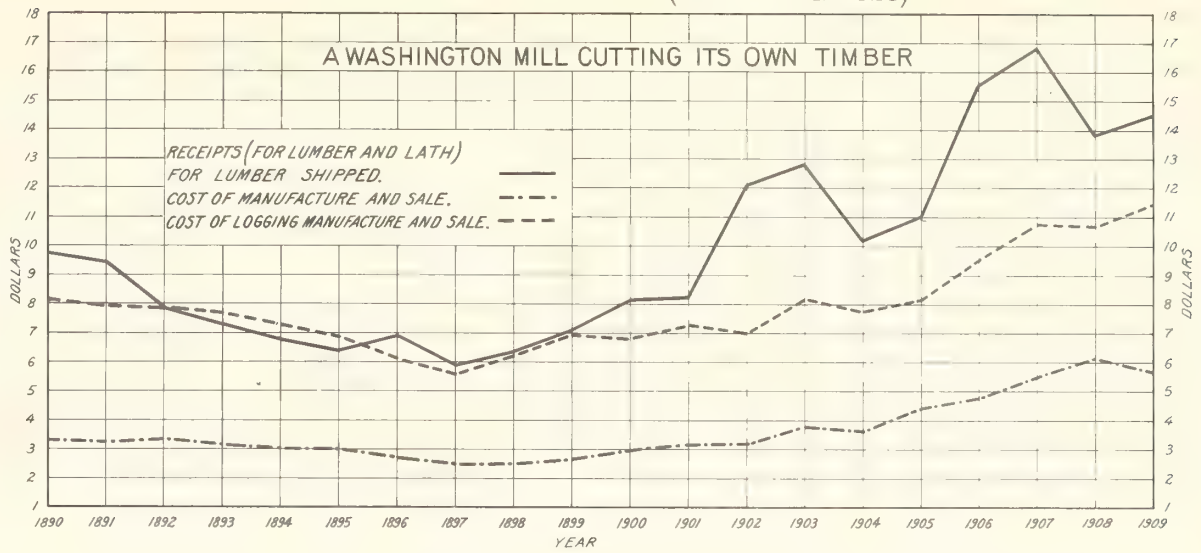
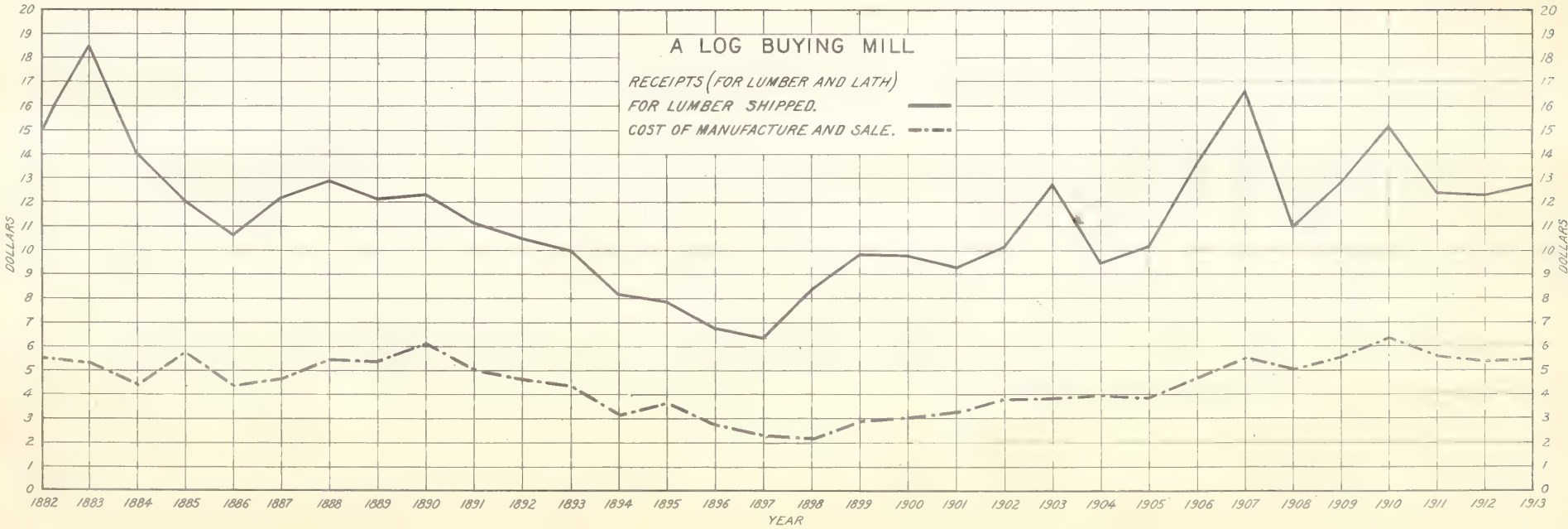
OPERATING COSTS AND RECEIPTS OF TWO DOUGLAS FIR MILLS LOCATED ON TIDE WATER (YEARLY AVERAGES)





has been located in the currency, its volume and activity. That is to say, the measure of value is itself unstable;* hence prices of an article taken at different times by itself may lead to wrong inferences. Safety in that direction ~~only~~ is reached only by comparison with prices for a large number of commodities.

In connection with cost of lumber as now furnished to the consumers of the country it has been pointed out that the cost of the freight haul, now much larger on the average than formerly, and especially high for the Douglas fir region, is an element that must be considered; also the more difficult situation from which in large measure logs are of late years taken. Full justice, however, involves this other consideration, change in the purchasing power of money, to be corrected for only by reference to a standard of value derived from many commodities. The same rule will apply in connection with returns to labor.

The standard taken for this purpose is that of the U. S. Bureau of Labor Statistics, based on the prices of 256 commodities lumped together, the results being given in its yearly publication entitled "Wholesale Prices." The first diagram of those on the facing page gives relations clearly, based on the prices of 1913. From the curves it appears that

*The 13th Census, Vol. VIII, page 26, points out that the value of the country's crops was 83% greater in 1909 than in 1899, while the quantity on the average was only 10% greater; or, in other words, that the average increase in price was nearly 67%.

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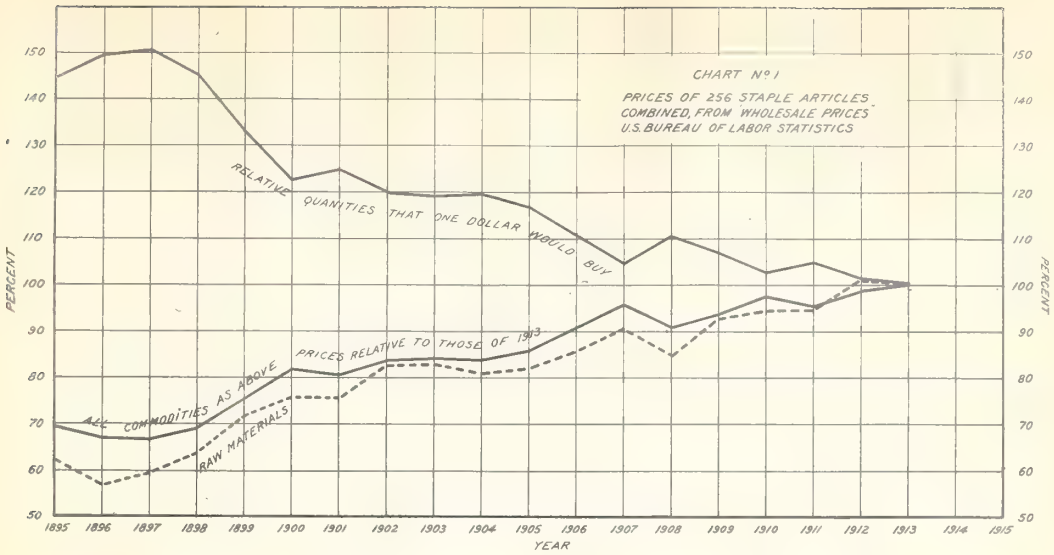
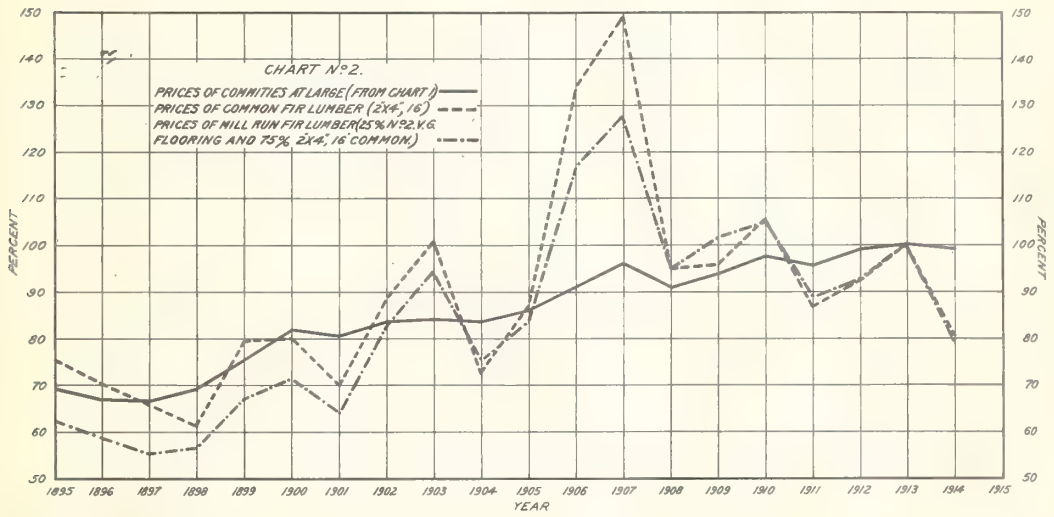
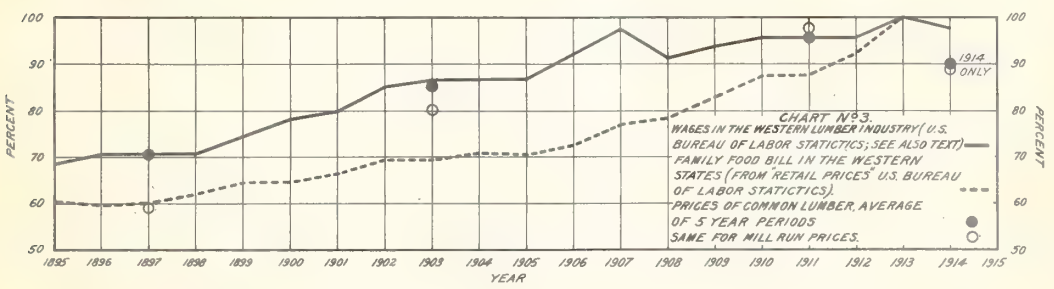
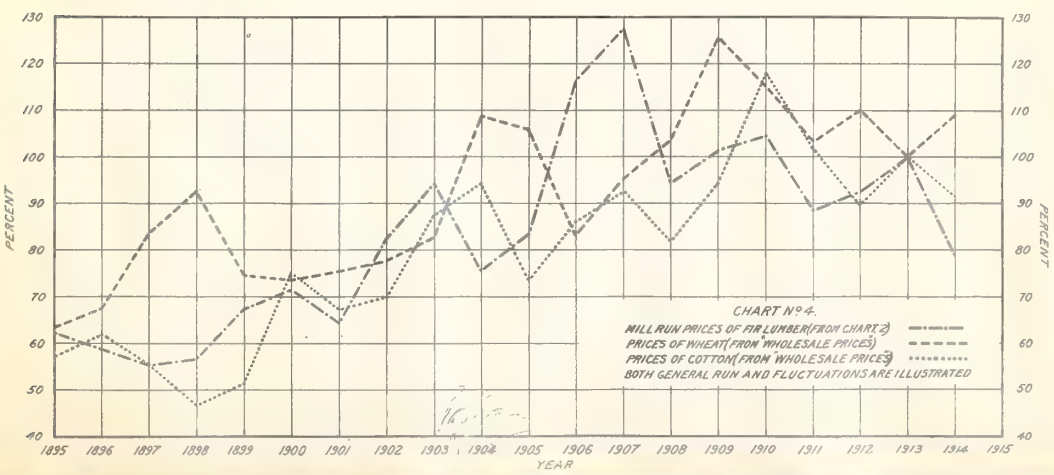
*The Lumbermen, Vol. VIII, page 56, reviews our issue the year of the country's worst, when the cost per M feet in 1909 was 10% greater; or, other words, that the average increase in price was nearly 6









TITLE FOR FOUR CHARTS

RELATION OF LUMBER PRICES AT DOUGLAS FIR MILLS TO WHOLESALE PRICES OF WHEAT, COTTON AND COMMODITIES AT LARGE, TO WAGES AND RETAIL PRICES OF FOOD LOCALLY. ALL DATA BY YEARLY AVERAGES AND REFERRED IN PERCENTAGE RELATION TO 100 PERCENT AT 1913 AS STANDARD OF COMPARISON.

in 1897 $1 in money would buy 1½ times as much of the standard commodities as it would in 1913; or in other words, prices at large were in 1897 67 per cent of those that held 16 years later.

On Chart 2 the price of all commodities is again represented, from 1895 to the comparing point in 1913. Against this is represented (a) the average price for each year at which common fir lumber sold in the Portland market,* and (b) the average price of fir lumber.** With the exception of the abnormally high years 1906 and 1907 (largely balanced by 1914 and 1915 not represented) the price for common lumber is seen, when fluctuation is allowed for, to run along with the index or price of commodities at large. The average price of the product, however, rises faster than the index, the absolute amount being about $1 per M. This stronger rise for lumber than for commodities at large was, however, to be anticipated for two reasons: logging cost, in view of the harder ground and greater distance to haul in late years, must have absorbed the sum named on the average; then there is in addition the element of increasing stumpage cost.

The points involved have also been brought out in relation to factors that more nearly concern the region. Wages

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* Billed out prices of 2" x 4", 16' Common.

** Billed out prices of No. 2 V.G. Flooring 25% & 2 x 4, 16' Common 75%.

paid in the lumber industry of the Pacific and Mountain States from 1895 onward as gathered by the U. S. Bureau of Labor agree exactly in trend with the only complete schedule of sawmill wages which could be locally obtained. There are also available from Government sources and for the same region, continuous retail prices of an assortment of food products of kinds and in quantity adapted to the use of an average family. These have been plotted on Chart 3, joining the two lines at a common 100 per cent in 1913.

In comparing lumber prices with the above the effort has been made to eliminate their extreme fluctuation. To this end the years 1906 and 1907, years of abnormally high prices, have been omitted, also the unwholesomely low prices of 1914 and 1915. For the rest, the price data for lumber have been grouped in five-year periods and the average of each period placed on the chart in its proper relation.

Consideration of this data allows the following inferences to be drawn:

1. In the market named the price of common lumber, the bulk of the cut and staple of ordinary use, has gone up at exactly the same percentage rate as the wages of labor employed in the industry. High grades of lumber have gone up faster in price than common, and in consequence the average price of the ordinary mill's cut has gone up somewhat faster than labor.

2. Neither labor nor lumber has risen in price as much as the local retail price for food products.

3. If then lumbermen have gone back further for

their logs of late years and in addition there is a greater cost for stumpage, the inference seems to be clear that the operating industry of the region has not been stagnant or absorptive, but that either the profit of late years has been moderate or that by better equipment and management it has improved its productive efficiency. This is believed to be a sound inference, although entire conclusiveness is not claimed for the data.

Chart No. 4 shows the relation of lumber prices in the region to the prices of wheat and of cotton taken from "Wholesale Prices" by the Bureau of Labor Statistics before mentioned. Yearly averages are given in each case, and for lumber the average price as earlier defined. General relations and relative fluctuations are both exhibited.

Summary

The lumber industry has long claimed that profit in manufacture is moderate and that where heavy profits have been made in the industry they were made at the stumpage end. That appears to be true in the region under inquiry.

Since, therefore, as was shown earlier, returns on timber because of changed conditions, promise to be but moderate from now on, and since the two things in the bulk of the industry are joined together and equally bear on the soundness and profit of business concerns, it is clear that the processes

of production must in future receive the utmost care. As a matter of fact, actual conditions have for some time been forcing that, bringing about economy and efficiency in production.

Division V.- The Productive Industry as a Whole

Introductory Statement

THE STRUCTURE AND ORDINARY WORKINGS OF THE PRODUCTIVE INDUSTRY HAVING BEEN RECOUNTED PREVIOUSLY, IT REMAINS TO DEAL WITH IT IN AN AGGREGATE WAY, AND PARTICULARLY TO POINT OUT LINES OF INTENDING DEVELOPMENT AND POSSIBLE IMPROVEMENT. THIS MAY NOT BE SOUNDLY DONE WITHOUT IN THE FIRST PLACE INTERPRETING ITS SPIRIT, AND, SECONDLY, DEVELOPING SOME POINTS IN ITS HISTORY WHICH HAVE STOOD IN FORMATIVE RELATION TO PRESENT AFFAIRS.

IT IS SHOWN IN THE FOLLOWING PAGES THAT, OWING TO SUCCESSIVE CHANGES THAT HAVE OCCURRED IN THE DEVELOPMENT OF A NEW COUNTRY AND INDUSTRY, A VERY COMPLEX SITUATION EXISTS TO-DAY, THE GREAT VARIETY OF FORCES IN THE FIELD BEING FAR FROM A STABLE AND HARMONIOUS BALANCE. IN FACT, ADJUSTMENTS THAT MEAN GREAT LOSS AND HARDSHIP HAVE BEEN WORKING OUT IN THE RECENT PAST.

SOUNDER AND MORE EFFICIENT BUSINESS, LEADING TO GREATER STABILITY IS POINTED OUT AS THE INDUSTRY'S CHIEF NEED. THE DISCUSSION BRINGS OUT THE DIFFICULTIES IN THE WAY OF THAT, DEVELOPS THE PROBABILITIES, AND SUGGESTS MEANS, COOPERATIVE IN PART, THROUGH WHICH IMPROVED CONDITIONS SHOULD BE ATTAINED.

Section 1.- Mainly Relating to the Past

Energy and buoyancy are the most striking features in the development of the lumber industry of the Pacific Northwest; it grew up from individual force and initiative.

The early industry was an industry not of capital, but of men. The first that came, round the Horn on vessels of their own building, bringing mill machinery with them, had little other capital. They were pioneers in a new land, men of daring enterprise, and they took long chances. The same was true later on also, as the industry grew. The more restless and daring from the eastern lumbering sections, together with men grown up in the industry on the Coast, with imperfect training and very little in the way of means, but full of energy, self reliance and faith, started enterprises of their own, extended them as markets widened, and built them over to meet conditions as they changed.

Conditions for many years were indeed unique. At home, splendid timber in unlimited quantities stood right on tide water; at the other end, in the growing commonwealth of California and the enormous populations all about the Pacific, were wonderful markets to cultivate. Expansion was the order, and that for years, limited only by the capacity to produce and skill in cultivating trade.

Early Industry One of Complete Units: Its Democracy

A characteristic feature of the early business is

that it was complete in itself - it reached from the stump to the retail distributor, however distant he might be. This fact afforded business advantages, and it also gave a great variety to life. The lumbering concerns of the Sound, for instance, not only ran their mills and did their logging directly or through jobbers, but they owned the vessels that carried the product to market, and these they also built. The financial center of the business was at San Francisco, and there also the concerns had distributing yards. Business connections were made all about the Pacific - in the South American countries, in Australia and the Orient - alert sea captains, who were almost as good at business as at seamanship, serving as the agents of trade.

With all this, the times were democratic. Masters and men were of the same race, often intimately related, and between them there was hearty comradeship. All classes worked hard and long, and solved together the industrial problems that arose. Those of small ambition worked quietly for wages; others with more commercial spirit took contracts and often made money in these or in real estate; back of all were the leading spirits, building for the future as such men have always built. Still it was democratic. If with the leading men there was any inclination to be otherwise than democratic and unostentatious, for long it was hardly within their power, for though profits might be large, expansion and the acquisition of land absorbed all the resources. The fluidity and democracy of the time, and

the fact that instinct rather than reason was the guide, is well illustrated by the fact that in 1868 a man who for many years had worked for one of the big Puget Sound concerns as millwright had thrust on him against his wish and judgment a block of its stock in settlement of wages overdue. Against his will, therefore, he is to-day a millionaire.

The history of the Sound region from the fifties to the eighties is very appealing. Concerns in those three decades grew from small struggling enterprises to great businesses, firmly established. Large land holdings were built up; logging methods were revolutionized; mills grew within the working life of one man from a capacity of 30 or 40 M to 250 M feet, their equipment at the same time changing radically. Of competition there was enough to stimulate but not to crush - seven concerns, each complete in itself with mills, logging plant, sailing vessels, tow boats, and stores, was the later equipment in that region. Such was the industry and the community that gave its commercial start to the Pacific Northwest and founded its export trade in lumber.

Railroads Bring New Conditions

In 1883 the railway line built down the Columbia River connected the Northern Pacific Railway with tidewater at Portland, and the next year the line was extended to Tacoma, though the Columbia River was ferried for some years. In 1884 the Union Pacific made connection with the new line and thus opened a route

to Omaha. Three years later, in 1887, direct connection was made between the East and Puget Sound, through completion of the main line of the Northern Pacific. Since that time two other lines have entered the same region, the Great Northern in 1893 and the C.M. & P.S. in 1910, while the Canadian Pacific established a good connection. Connection to the south was made by the Southern Pacific in the early nineties, joining the region by rail as well as by water with its great natural market in California. With that, the connections of the region were completed and outlets for fir lumber established which were not materially changed until the Panama Canal was opened.

The railways themselves created a great demand for lumber. Their first structures, temporary in large measure because built as cheaply as might be, called for great quantities of the simple products of the mills, ties and timbers. Then their station houses and other buildings required other sizes and grades, while the cars of those years, in both frame and superstructure, were built of wood. With the early nineties, therefore, railroad demand for lumber began to be a mainstay of the mills. In fact, for the 20 years succeeding, the railroads took, in one form or another, about one-third of the fir output that was shipped inland.

Facilities afforded by the opening of these railroad lines for marketing lumber in the East were taken advantage of, after 1893 particularly when moderate through rates of freight were established over the different lines to St. Paul and Omaha, and corresponding rates to other points both nearer

and farther. The great lumber consuming region in the growing States west of the Mississippi River had up to that time been the exclusive marketing ground of white and yellow pine mills in the Lake States and the South, but the low price at which fir could be put aboard cars enabled it to stand the freight disadvantage and compete in those markets. The material required had great variety.

Of the rail connection with California, the mills in the Willamette Valley of Oregon were situated to take best advantage. A favorable freight rate to San Francisco Bay points early established by the Southern Pacific was the first stimulus to extensive lumbering in that region. This, however, was later taken away and facilities for shipment in that direction have been the subject of much bickering and litigation since, between shippers at different points and with the railways.

Another region that since the opening of rail routes has furnished markets for great amounts of fir is the interior region embracing Eastern Washington and Oregon, Southern Idaho, Utah, Wyoming and Colorado. All parts of this region have more or less forest resources of their own, but Douglas fir, located close to rail and put out at low prices and in enormous quantities, has been able despite the freight haul largely to slow down their development. This has been far more marked in very recent years than earlier.

Response of the Industry

Accessible correspondence, as well as men's memories, show how producers went after the business, and how, as is the case when any new market opens, they studied the volume and nature of the demand. In materials of the different kinds required for car construction fir took its place at once; from beveled siding made of spruce men expected much at the start, but cedar soon displaced it. In regard to doors, somewhat the reverse has taken place; cedar, the first wood employed for this purpose, having of late been replaced by fir. The cedar shingle of Washington was a unique product and went at once and in large volume.

To the new field most of the old cargo mills turned as far as they were connected up with rail, and there has been large and well distributed extension of mill capacity located on tide water. Also a new crop of mills sprang up along the railroads. These in the early years as in the former case, generally started small, and in large part they were simple plants, producing a small range of products, frequently only ties and timbers. A circular sawmill cutting 30 or 40 M, an ox logging outfit or later on one donkey, and some kind of claim on one or two quarter sections of timber, was the typical outfit. Many a man now wealthy started his independent business career with hardly any capital at all. Many too have been through failure.

For 20 years past this interior development of the lumber industry has been proceeding, utilizing the growing network of railroads. During the period increase in the size of units has been broadly characteristic; methods also have been improved and somewhat standardized. At the present time lumbering has penetrated to every part of the region. Of present mill capacity about half is inland and half on tide water.

Expansion, Its Dangers

At this point it seems desirable to present the history of production as far as that is shown by available statistics. These for the whole of the two States, including since 1900 some pine cut east of the mountains, and for five-year periods, are as follows:

Lumber Produced by Oregon & Washington Together

From U. S. Census

1890	1,505,625 M
1900	2,158,386 "
1905	4,805,351 "
1910	5,611,153 "
1915	5,574,438 "

The meaning of these figures is:

a. Moderate expansion in the decade from 1890 to 1900, not faster no doubt, because of the general hard times, which affected the region chiefly in the years 1893-97.

b. Very rapid expansion in the first half of the next decade, and in fact up to 1907.

c. Production in the years 1908-15 will be covered in detail later. For the present it suffices to say that there have been ups and downs, but on the whole the volume of production has remained approximately stationary.

These statistics of production are central to the phenomena of the whole industry. Also, with price, they furnish a key to business prosperity and financial ease, or the contrary, in the two States. With production shrunk 20 percent and selling price a much larger proportion, realization in a year of depression is not much more than half what it is in an active year. Inevitably much retrenchment and painful adjustments in many fields succeed.

Financial Basis of the Industry Changed

With the broad facts of expansion established for the period culminating in 1907, several important matters require development. In part they interpret the lumber industry as a whole and form the key to its economics. The financial basis of the industry is first to be covered.

1. Enterprises in this period, as earlier, for the most part, started small and created their own capital. That they had to do in the circumstances. It was not uniformly the case, however, for after 1902, particularly, much capital representing

investments in the Lake States then being closed out was reinvested in enterprises here. This creation of capital required as a whole generous and increasing realization for lumber, which for a decade, culminating with the boom of 1906 and 1907, was actually had.

This multiplication of enterprises starting small, gaining fast, and expanding with their profits, is very characteristic of the American West, and very attractive to study even in retrospect. It is only possible in a new country, itself expanding, establishing wider relations, realizing also on a stored up native resource. For the time, however, it presents business opportunities not parallelled at any other.

The feeling of the time may be gathered most surely from men who conducted the banks. Their office in a new country they looked on as constructive, and their rule during the period was to give every likely man his chance. No limit to opportunity was clear; hundreds were trying, and no one could tell just who would succeed. Give every man his chance and let the best man win, was, therefore, the rule, the sole check being protection to the bank's funds, and even that was not always effective. Every manufacturing city shows the results of this nurturing. Of one on the Sound a local banker states that only one concern ever started there with what could be called adequate financial backing.

2. But with the general expansion and success, there were also many failures. One cause, of course, is simple efficiency.

While standards were not high, there was nevertheless too much in the game to allow every man to succeed at it. Ill planned mills, badly run woods work, weakness especially with credit and otherwise in the selling department, all tripped up their scores of men who with natural ability and force, perhaps, nevertheless had not as a rule thorough training. Adjustment to changed demand was also a stumbling block to some. Then the sudden wealth and the rapid expansion of association it brought were too much for the character of many.

Here again, the banker of an interior Washington town gives the clearest insight. Pride, well grounded and justifiable indeed, is taken in the careers of the men who, with clear heads and steady judgment, justified expectations. But more in numbers of those whom he started to help, men who at the time perhaps promised as well as the others, fell one after another by the way. By his account this was oftener due to failure of character than acumen. Too quick prosperity to be carried, associations reached through success that turned their heads, the temptations of the city presented to men whose life had previously been plain or hard - results from these things showing for a while, and then a conference with the banker painful to both but necessary for all concerned, and that enterprise ceased to go on.

3. During the 15 years ending with 1907 the business changed in type from one mainly of men to one in which con-

siderable capital is ordinarily required. It is, therefore, harder to break into lumbering now than formerly. The regret that such a change occasions must, however, be balanced by consideration of the fact that standards are higher now, that on the whole, lumber is more cheaply produced; also that more by far, both in quantity and quality, is got out of the timber than was formerly the case. The elements involved in this change of financial relations may be stated as follows:

a. Standing timber came to have considerable value and to be more strongly held than formerly.

b. With some exceptions, it stands in such locations to-day that the old simple methods of operation do not suffice for logging, but considerable investment in means of transportation, etc., is required.

c. The economical logging unit is therefore larger than it was formerly, and the same rule applies with greater force to manufacturing plants. This last was made clear in earlier pages, and it was also pointed out that more operating capital has come to be required in order to properly dry the lumber and maintain stocks suited to meet the demand of the market.

Reaction Started

The years 1906 and 1907 need special characterization here. Those years marked the culmination of a period of business expansion the country over; lumber and stumpage values generally were influenced by the conservation movement; but

special factors created a real boom in Douglas fir. On April 18, 1906, occurred the earthquake in San Francisco, and that city, always a heavy buyer of fir lumber, for the year from July 1906 to June 1907, inclusive, while in process of rebuilding, absorbed 925 million feet, double the amount it had been accustomed to take. Nor was this all. An earthquake and fire at Valparaiso, Chile, occurring in August of the same year, added some demand from one of the regular foreign markets for fir. Lastly, at the same time Canada was building two of her great railroads and calling heavily for lumber on the mills of Washington. The extra demand from all these sources taxed the plants of the Northwest to the utmost, and overtaxed its facilities for rail and water shipment. The whole industry was heavily stimulated; fortunes were made by those favorably situated and alert; the price of logs and of lumber went up to an unnatural point, while the slack was taken up by the stumpage valuation.

1907 at the time was widely recognized as the most profitable year ever experienced by the lumber industry, and the men were many and widely dispersed who were carried off their feet by it. The conditions of that year, however, were very influential in starting reactions from which the industry has since suffered. Substitution of other materials for lumber gained substance from the high prices of that year, and the movement fairly started has since gained steadily in volume. It is, in fact, to-day one of the most potent forces affecting the lumber industry.

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Labor Problem Arises

Two special features characterizing the development of the industry through this period require illumination at this point, the change in the type and quality of labor, and lumber association work.

Up to the late nineties an abundance of native or provincial labor was available for the wants of the industry, particularly good labor, not only because of its physical efficiency, but because of intelligence, reasonableness and kinship in blood and speech to the industry's leading men.

In August, 1897, news of the gold discovery in the Klondyke reached Seattle, and a strong exodus of the more capable and hardy began. The effect of this was lasting and there were indirect consequences. From that time on more and more foreign labor was employed in the industry in the Northwest, in large measure efficient it is true, but not of the old American stock with its kinship and its ideals. In 1910, 300,000 or one-sixth of the population of the two States, was foreign born, and a large share of the woods and mill labor came from their numbers. Several nationalities among those represented are most estimable and their stock is settling the country to-day as some decades ago they settled the Lake States. Others do not so adjust, but remain apart and give rise to a variety of labor difficulties. None, however, are less satisfactory and more potent for harm than the native American who is thoroughly out of tune with his conditions.

The matter of labor's demands lumbermen of the Northwest have met with democracy and the comradely, if somewhat rough, human feeling that has characterized the lumber industry of the United States everywhere - for instance, one reason for the continued operation of plants on low price levels is often regard for the welfare of labor. The wages paid look liberal and, as was lately pointed out, they have advanced at a rate equal to the price of the product. Lumbermen too, have given rather general support to state measures for the improvement of labor conditions, - accident prevention, accident insurance, first aid to the injured,- even prohibition as a measure of industrial reform.

Associated Effort Became Essential

The second collateral issue is association work, which for this region took shape during the period under review. Different aspects of this may be viewed differently, but that there is a necessary field for associated effort is clear. There are weighty and legitimate interests of the industry to maintain, such as those relating to freight rates. The adjustment of claims and complaints at a distance is a matter of importance to all concerned and would be hard to secure except through cooperation. Reliable information on credit is not only indispensable for the safe conduct of business but of vast moral value as well. The standardization of sizes, patterns and

grades is a matter of vast and varied benefit, of far more consequence in a business way to the consumer than the producer of lumber. It is not always understood in this last connection that standardization widens the field of competition and promotes economical and effective use of the natural resource.

The services above noted associated producers, with some help from the merchandising fraternity, have rendered to date, and no better means has been put forward for handling them. In developing means for the purpose, the region has been slow, not moving with clear insight and precision, and the organization now in force is a dispersed one. The West Coast Manufacturers' Association, the central agency of those in existence in 1915, contains but 60 percent of the mill capacity. An inspection bureau, a shipper's association, and an information bureau divide the field of activity with it.

Section 2.- Mainly Present

The Story Told by Production and Price

In continuation of the statistics of production given on page_____are the following, yearly, covering the period from 1905 to date. Of these figures, those for 1909, 1913 and 1915 are most accurate and complete.

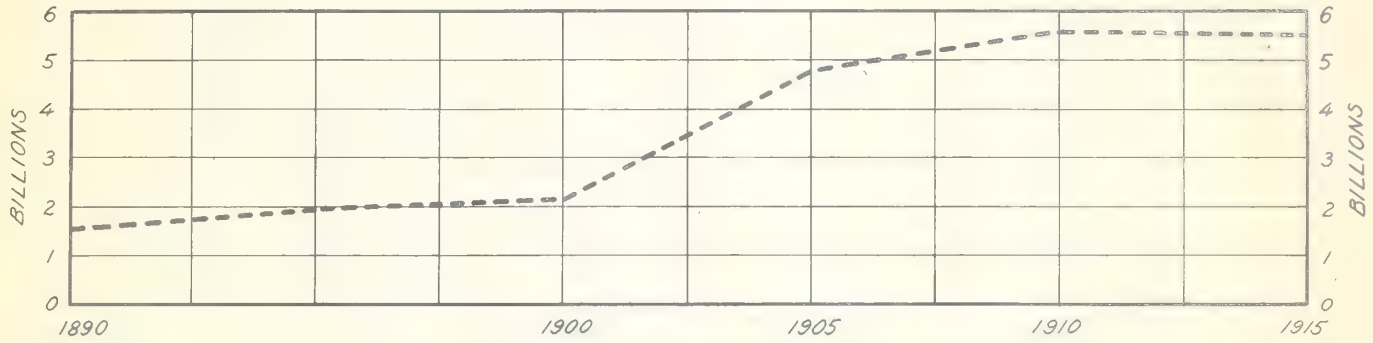
Approximate Production of Lumber in Oregon and Washington west of Cascade Mountains, 1905 to 1915.

Year	Washington	Oregon	Aggregate
1905	3,590,000 M	1,170,000 M	4,760,000 M
1906	3,915,000 "	1,470,000 "	5,385,000 "
1907	3,380,000 "	1,490,000 "	5,870,000 "
1908	2,560,000 "	1,280,000 "	3,840,000 "
1909	3,440,000 "	1,670,000 "	5,110,000 "
1910	3,735,000 "	1,800,000 "	5,535,000 "
1911	3,760,000 "	1,560,000 "	5,320,000 "
1912	3,780,000 "	1,730,000 "	5,510,000 "
1913	4,190,000 "	1,830,000 "	6,020,000 "
1914	3,670,000 "	1,580,000 "	5,250,000 "
1915	3,590,000 "	1,400,000 "	4,990,000 "

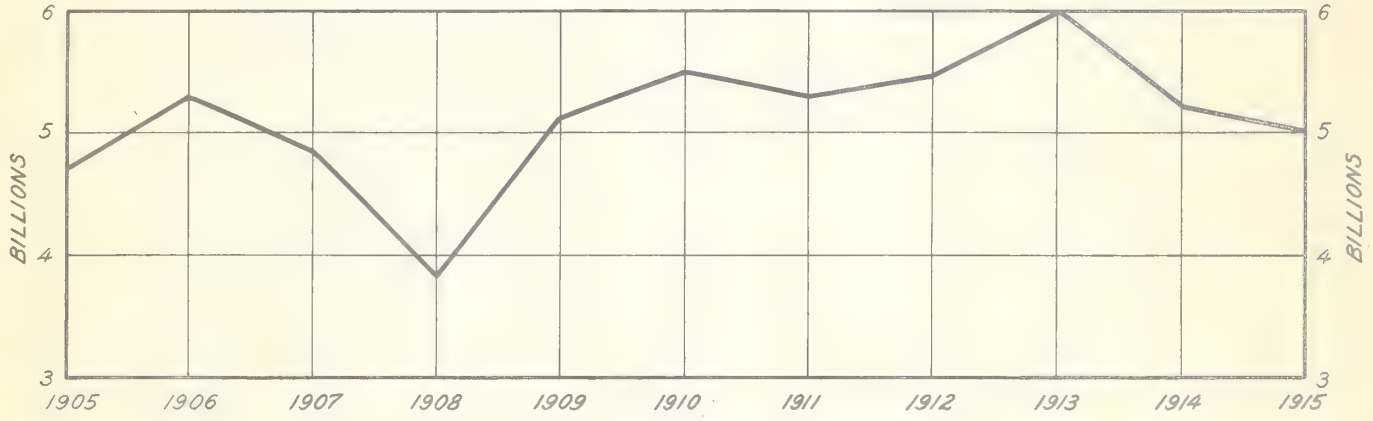
Things to be particularly observed are the strong drop in production in 1908, considerable shrinkage also in the years 1914 and 1915, with 1913 setting the high record. These relations and those of the figures earlier given the diagrams show graphically.

Relations during the later period are markedly different from what they were earlier - increase in production is not clearly observable. On that head, in fact, expectations have not been met; it was once predicted that there would be

LUMBER PRODUCTION OF OREGON AND WASHINGTON
FOR THE DECADE AND HALF DECADE YEARS, 1890 TO 1915.
FROM THE CENSUS.



APPROXIMATE LUMBER PRODUCTION WEST SIDE OREGON AND WASHINGTON,
YEARLY, 1905 TO 1915. FROM THE CENSUS.
ADJUSTED IN PART.



a production of 16 billion in the region in the year 1916.

On page_____are given diagrams which represent the selling prices by months, for the same period and earlier, of certain grades of fir lumber, high and low, representative of the cut. These prices are billed-out prices - those paid by the buyer, less freight, on which, however, to get exact realization by the mill, some adjustments, - discounts, underweights, etc., - have to be made. They were taken from the invoices of certain sellers of lumber in the Puget Sound region, dated with the shipment.

In connection with these price curves there are to be observed:

a. A general strong increase of price from the beginning of the record up to 1907, justifying broad statements made earlier.

b. Waves of price through the record, well marked, timed three to five years apart.

c. A heavy drop in prices on most items after 1907, and after that and on to include the year 1913 varying realization on about a general level.

d. A heavy drop in prices in the middle of the year 1913, with a low range continuing to the end of the record.

e. Incidentally two things collateral to the main subject may be pointed out: - First, that the more valuable grades of lumber have gained faster than the others, and held their gain better in the late price waves, a broad fact dependent on

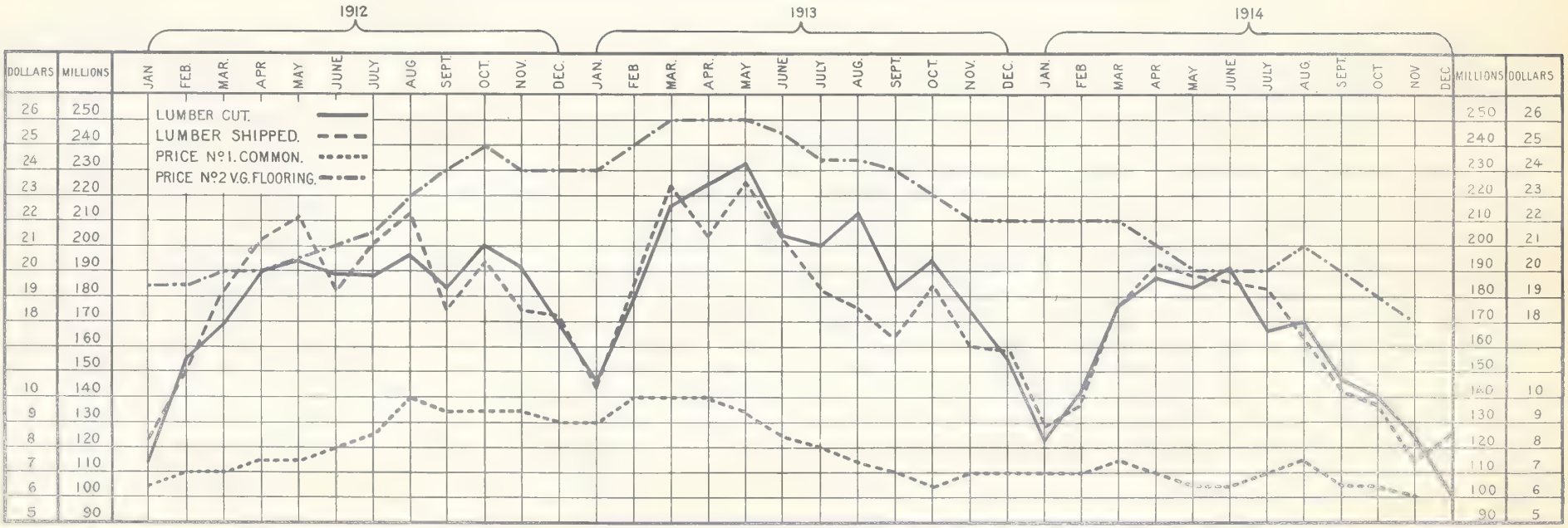
relative appreciation and demand for the various products, to which sellers of lumber make constant adjustment, though it may be instinctively; second, that since 1900 at each recurrence of low waves of price, just about the same point has been reached by those grades making up the bulk of the cut, the standard patterns of common lumber. The meaning of this fact is indicated later.

Conditions Highly Competitive

An inference to be drawn from these price records is the softness of the market. The price waves are very marked, and they follow rather closely the figures for production which vary among themselves by a less relative amount. The diagram next presented, representing monthly production and shipments for 1912, 1913, and 1914, with prices had on two representative grades, a diagram prepared by the Lumber Association Secretary from the records of 80 identical mills, will further disclose that. On this general head the expression current in the region is that 2 percent overproduction will cause a 20 percent fall in price. On the other hand, there is occasionally very quick response in price to demand and shortage of stock.

The same fact constitutes a strong indication of the competitive nature of the industry. On that point the diagrams may convey a false impression in that they do not show the

THREE YEARS' CUT AND SHIPMENT REPORT FROM 80 IDENTICAL MILLS WITH PRICES OF TWO REPRESENTATIVE GRADES



COMPILED BY THE WEST COAST LUMBER MANUFACTURERS' ASSOCIATION AND THE LUMBERMEN'S INFORMATION BUREAU.

variations in price that occur in the same market at the same time. The prices presented are a composite from several strong sellers, and among them there was material variation.

The fact of competition might indeed be demonstrated through the record of bids for lumber required by branches of the Government and in numerous other ways, while the description of the organization of the industry in the merchandising field conveys the same idea. That is not to say that there is no cooperation among lumbermen in the field of prices, or that it has no effect. Such a condition would be impossible to establish.

Overproduction

The subject now reached is much discussed in the region as a main source of its recurrent troubles. The term, however, is not uniformly understood, for some deny the fact as long as all the lumber produced is sold and utilized. In the general and normal use of the word, price in fact is connoted. The operation of supply and demand is taken for granted, and overproduction means production in such volume as depresses the price below what, from the point of view occupied, is considered a desirable level. For the present purpose both producer and consumer are considered, and "overproduction" is connected with what may be called the "living price," a price that is, which without extortion affords reasonable profit to

variations in price that occur in the same market at the time. The prices prevailing are a composite from several sellers, and among them there was material variation.

The fact of competition might indeed be demonstrated through the record of bids for lumber required by various the Government and in numerous other ways, while the description of the organization of the industry in the western field conveys the same idea. That is not to say that there is no cooperation among lumbermen in the field of prices that it has no effect. Such a condition would be tantamount to autocracy.

Overproduction

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efficient producers and provides adequate wages to labor. Good utilization * of the resource also comes within the scope of the definition.

Considered in this light, the fact of overproduction in the recent past is evident (what has preceded is considered to have established it) and it remains only to locate the causes.

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*Note:

Elsewhere in this work it is shown how utilization improves with rise in price, that fair, normal prices enable most concerns in the fir region to practice good utilization of raw material, practically speaking, that standards were somewhat lowered during the period of depression in 1914 and 1915, while heavy waste of material would probably result from long continuance of such conditions.

Carrying the idea into the future, it is clear not only that such portion of our timber stock as is wasted in present operations never will come to use or serve the higher and special uses of which some of it is capable, but that by so much the reserve timber stock of the country is lessened - its most evident recourse in future and its surest safeguard against excessive lumber prices.

The public, then, is broadly interested in this matter. If normal business conditions are considered to serve its interest sufficiently well, it has a variety of reasons for wishing these to the lumber industry.

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for widening these to the lumber industry.

Of these the main ones have been indicated in preceding pages, and are as follows:

a. The effort to unload stumpage investments on which men find it difficult to meet current charges, or of whose success as a holding proposition they are in doubt. This tendency is increased by the amount of indebtedness, and appears to be the strongest and most fundamental force working in this direction.

b. The economics of operation leading to steady running and a tendency to increase output progressively. This exists in both logging and manufacturing departments.

c. The cost of idle plant and the desire to keep investments productive is a considerable force in times of slack demand.

d. There is considerable excess in developed plant over market requirement, represented in respect to mill capacity by the following census data, but with estimates, not reports, for a portion. On logging plant no statistics are available, but there is believed to be a greater excess than in the case of mill capacity. Comparison of the figures for 1912 and 1915 is not entirely satisfying. However, it is known that there was something of a balance between the mills built during the period and those burned or otherwise put out of commission.

	Oregon	Washington	Aggregate
Mill capacity 10-hr. day 1912	10,570 M	19,240 M	29,810 M
" " " " 1915	9,175 "	17,940 "	27,115 "

	Oregon	Washington
Mill capacity 10-hr. day 1912	10,570 M	14,440 "
" " " " 1913	9,175 "	17,940 "

Possible production reported by mill owners "if market and other conditions were favorable." *

1912	2,692,917 M	5,539,880 M	8,232,797 M
1915	3,790,100 "	7,003,400 "	10,793,500 "

Weaknesses of the Industry

The above are broad, fundamental considerations, arising from the nature of the industry, its history or setting, and are mainly beyond immediate control. Some features may, however, be enumerated which are more within the power of the industry to correct.

1. It is clear in the first place that there has been a good deal of sheer carelessness and incompetence. Mills have been built that were poorly designed, not adapted to the work in hand, and business has often been run by men equipped neither by training nor ability for the conduct of such work. This has meant loss to operators and backers, illegitimate competition for sound concerns to meet, and worst of all, perhaps, from the broad point of view, misdirection of human effort. The range in efficiency has been characterized by one entirely competent man in the statement that of the many possible advantages that can be thrown away some operators do not retain any. Another, in declining to leave a salaried position and go into business

*The figures indicate that the question was not understood in the same way at the two dates. Of 8 ½ billion feet actually reported in 1915, 2¼ billion was in the form of night shift capacity.

with men who were ready to furnish a certain amount of funds, told them it would take a lifetime to educate them to appreciation of the necessity of measures and expenditures that for efficient operation were really required.

2. The producing industry is not strongly financed (indications are that the average interest charge for logging and milling together is not far from 70 cents per M of output) and there are numerous cases of really inadequate financing. Of this a particularly good illustration recently occurred in the failure of a concern intimately connected with a banking institution which also failed. This when taken over by the receiver, on a paid up capital of $50,000, had indebtedness of $195,000.* Concerns financed in that way are not really efficient, and can not fairly expect to weather a dull period. Their efforts to save themselves are not infrequently a source of demoralization to the trade. Yet the chances in this case were taken deliberately by men of good standing and long experience.

Further than that again, there might be cited certain promoters' schemes by which local financiers as well as distant investors have been recently fleeced, while the legitimate industry suffered from subjection to a kind of competition that can not be met.

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*Of the plant the receiver, a successful lumberman, states: "This plant is not arranged for economical handling of finished products, and neither is it a good timber mill. It was planned and built by an inexperienced man, with the result that it requires nearly twice as many men as it should to handle the output."

Much less blameworthy, but a matter of considerable influence locally, is the tendency of all parties concerned to favor the manufacturer. Loggers, banks and makers of machinery have all been free in this regard. It is a frequent phenomenon for the two latter to have entire plants and even blocks of timber on their hands as a result of extensions of credit. The forced sales resulting not only mean loss at the time, but they bring in new concerns on a low basis of investment and contribute again to instability.

The condition above depicted comes down from the past; is influenced by the general atmosphere of the region; also, with other things, is tied in with the tendency of lumbermen to make operation subsidiary to stumpage investments, and in their enthusiasm for these to use their credit to the limit. In this respect, however, it appears that the industry, realizing that easy profits are no longer to be expected from stumpage, is now making a radical change. Added strength at this point will render the business more stable and sound in every way. Greater ability to carry stock will be of particular advantage in affording resisting power in times of slack demand, from which would accrue advantages to labor as well as operators.

3. Related to the last is considerable inadequacy in bookkeeping and lack of sound understanding of the principles of finance. This too is mainly a hold-over from earlier times when business was simple and on a small scale. The forceful

and competent operator in such circumstances might be perfectly sure he did the right thing, and if he kept track of his cash and bank account might really require no other aid. The growth into large concerns has been so rapid that direct personal management has largely held over, and that accounting should lag behind is to be expected.

Haziness and slight of hand are particularly evident in the treatment of stumpage. Stumpage has been a gamble in the past and is felt as such to-day. In but few cases have clear thinking and sound financial principles been applied to it. Accurate cost accounting is particularly serviceable in determining the price levels at which profit is extinguished.

On the other hand, there is demonstration in the region of the fact that elaborate accounting will not replace actual mastery of the details of business.

4. Proportionately and compared with earlier times, the spirit of enterprise may be called weak. Concerns that have made their fortunes, as some have, have not the ambition of those that are struggling and new. Others that have every inducement and desire to push enterprise are under handicap by reason of their small size in relation to the industry as a whole and the distance of the markets. The helplessness of producers in connection with the export trade is an excellent illustration. Another is the fact that fir lumber required for the Panama Canal was furnished by a shipping firm which

bought it of the mills. Particularly inadequate representation in an important market is shown by the way in which, just previous to the opening of the Panama Canal, fir was presented to the New York market. That is illuminated by the following market report by a New York Commission house, published in April, 1914:

> "It seems that almost every producer, large and small, is going 'on his own hook,' and a great many so-called lumber salesmen are offering the stock. If added emphasis is needed to convince an individual that he is not a salesman, it is to be conscious that he has offered stock to a prospective buyer at a lesser price than the buyer had anticipated paying. This fact is true in numerous instances of offerings of Pacific Coast timber on this market when blanket prices of $21 per M delivered on dock this port have been quoted, with buyer's privilege of making out a dimension specification in sizes and lengths to suit himself. $4 in excess of this figure would suit the buyer just as well and still equal or be under the quotations on competitive stock."

Here again, noteworthy exceptions could be cited.

5. Compared with many other lines of business knowledge of markets has been weak, while very little merchandising pressure or skill has been put out in the interest of lumber until very recently. In this field a marked change is now being forced, characterized by the statement that whereas lumber used to be bought, now it has to be sold. But beyond that, fir operators in the past seem frequently to have stood in their own light in that they have not always paid sufficient attention to service, nor handled buyers in a way to retain their liking and custom. To raise prices sharply in case of temporary advantage is not conducive to continued purchases

if other sources or other materials are available. Men that are in a position to know have stated that there has been marked and continued disregard of purchasers' requirements in respect, for instance, to the shipping of mixed cars of lumber. Here as everywhere, there have been marked exceptions - concerns, for instance, which focused on a special trade and held it in good times and bad by reason of satisfactory service.

Complaints of producers as to the bad influence of brokers and commission men on the business may be referred to at this point. This seems to have been great in times past but to be very much less at present, due to the elimination of many middlemen through competition and the growth of sounder business as a whole. There would seem to be neither likelihood nor necessity for the elimination of sound wholesalers from the business; and the commission feature should gradually improve through better organized selling on the part of producers and the exigencies of competition. Following are grounds for the work of wholesalers:

(a) They are often large and permanent enough and well enough known to be able at a very low expense to place fir products.

(b) They are almost indispensable to small mill men except for local selling.

(c) Men who are good manufacturers on a considerable scale frequently lack the selling talent and sometimes the financial strength required. To such, an efficient and reliable wholesaler is a blessing.

(d) Very large orders and trades of a peculiar nature that require the gathering up of stock from many plants will be best handled by such men until, at least, there are very much larger producing units than at present.

6. There is strong complaint of the disturbing influence of small mills on the market. The small mill has been referred to at various points, and on page_____the lamentable condition of a group of such enterprises was recounted, the results in some cases including not only loss but severe suffering and demoralization. The examiner writes (July, 1913): "Could not sell plant for 10 per cent of its cost". "The entire property would not pay half the debt". "So disastrous had been the venture in a few instances that men concerned apparently could not muster sufficient courage to discuss matters in a clear light".

That this condition at this time is otherwise than inevitable is not asserted. In connection with one or another of these 18 plants every sort of mismanagement was found - entire inexperience, mill machinery bought by mail order entirely unadapted to the work, logging operations run without any plan, merchandising of the lowest possible description. In regard to the check and guide afforded by bookkeeping, the examiner writes - "The chief hindrance in getting data that enables one to draw definite conclusions is the partial or total absence of records relevant to the mill's history and business". Enterprises run in that way could not be expected to survive except when serving the necessities of some isolated

standards of efficiency were raised in the plants that operated. The output of these increased, so that from now on producing units will be fewer and larger.

b. Of timber there have been numerous sacrifice sales and a general weakening effect on stumpage. It is probably not true that within three years there has been further concentration of timber holdings, but on the other hand conditions have been produced which seem to favor it.

c. Because a considerable share of the labor was out of its accustomed job, there was in the region a large amount of unemployment with its attendant suffering, lowering also the supply of labor and labor efficiency. Unemployment is probably the worst feature of the situation socially considered, and it seems hardly possible that the industry itself, even if it were stronger and used its advantages to the utmost, could relieve the whole of it.

In respect to wages paid, there was much variation. In some cases wages were cut severely, much below a desirable level, while some concerns closed down rather than meet competition in this form. In numerous concerns that operated, the majority perhaps, there was some reduction, an adjustment on this head agreed to as reasonable by both parties. But one strike followed wage reduction in lumber plants. Difficulty of that kind was much more severe early in 1913, on the higher wages.

Competition: What it Means and Does

In 1912 and 1913 the lumber industry had nine months of good free times. Most admit that, while a few even say the times were too good to be reasonably expected to last; and there are two circumstances confirmatory of that - first, that labor difficulties arose as they seem to do pretty certainly in times of liberal profit; second, that there was much double shift work, while a number of additional mills were put into commission. A good volume of railroad business was a feature of this period.

At the middle of 1913 demand fell off, but the mills for a time (See chart, page____) kept on producing. Prices fell off in response and had reached an undesirably low level by October, at which level approximately, with one slight rebound early in the next year, they stayed until further depressed by disturbances resulting from the European war. That unsettled conditions in the inland markets, while owing to the stringency in shipping the export trade was largely cut off. Production through 1914 and 1915 was approximately 80 percent of that of the year before.

Results in several directions are as follows:

a. Numerous producing concerns have failed. Of these plants, some will never do business again, while others will go on under new owners let in on low valuation and thus contribute to further instability. The general level of efficiency was raised by the eliminations, and under the stress

community, and their elimination, if correction could not be had, will be a benefit to all parties. On the other hand, several small plants were noted at the same period running as successfully as the average.

The region, however, is one of large units (but 14 percent of the cut of 1913 was produced by plants manufacturing less than 10 millions) and the demoralizing effects of the small mill on the general market are believed by some to have been overestimated.

The small mill has its place, though that for the present is a minor one. A distinct advantage is the light investment and overhead expense comparatively, enabling it better than others to run intermittently. The small mill man, or the man thinking of engaging in that business, needs cautioning and guidance to make his operations sound, for his own benefit and that of competitors. The following are conditions which determine whether operations of this type dependent on competitive markets may be successful:

(a) A logging chance not too hard and timber of medium or low grade; (b) a mill constructed for the purpose in hand, and the selection of orders adapted to its product; (c) sufficient capital, and real business ability. These requisites have often been had in the past, and that is occasionally the case to-day, but the rule appears to be otherwise. The keen business ability that is often exhibited in the portable mill work of New England appears in the Northwest not to turn to this class of business.

d. It is probable that no more lumber was sold because of a reduction in price below the living point. That idea runs counter to the teachings of economics, and indeed would not hold true of many commodities, but in connection with this great staple indications are that this is the case. The reductions in price simply added to the burdens of labor, operators and the surrounding community. Nor were they demanded by the trade, which would much prefer stability. They represented competition within the industry itself, and simply settled the question which operators and which workmen should produce the volume of lumber demanded.

e. Having in mind the relation between producer and buyer, the psychology of the market affords insight into the strong fluctuations, and is best considered at this point. These periodical dips in price to a point that represents approximately cost to efficient producers seem to be looked on as inevitable, even to the extent that men are superstitious about them. The reaction of the parties to conditions and to one another serves then to accentuate them. Thus on the downward turn of the market there are strong concerns whose distinct policy it is to <u>beat it</u>, and even production is rushed to get out a larger volume of lumber to be sold before the closing down point. With a distinct upward trend to the market, conditions are reversed; production is not hurried; selling efforts are slackened; orders are taken but little ahead. From the buyer too comes additional reenforcement of

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[illegible] be [illegible]

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the technology of the market efforts thought into the
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the price wave. His business to-day is largely watching the freaks of the market, in the effort not to be beaten as it falls by a competitor who purchased lower, and not to be caught short during a rise.

The above features in the situation and makeup of the industry, so far as they are weaknesses and lacks, can be fairly regarded only in connection with their local and historical setting, and coupled with their formulation should go free acknowledgement of energy and ingenuity on its part, its democratic human feeling, and the many valuable things it has accomplished. In addition to the above, the great complexity of the situation is also a factor - the variety in the size and strength of units, equal variation in efficiency, and the range of personal motive embraced. In conclusion, the attitude of producers toward their business will be illustrated by a quotation from a writer of lumber editorials: "The lumber business, ever since stumpage reached a real value, has been one of uncertainties, of ups and downs, of profits and losses - sometimes of big losses, sometimes of big profits. It has been a hazardous business, but in the main a fairly profitable one, and extremely interesting and attractive to those engaged in it and undertaking its hazards".

Section 3.- Of the Future.

Expansion

Expansion of output is to be expected as a result of the forces at work; it is also a business necessity and should afford relief. It is a necessity primarily because of the pressure of timber holding charges; it is to be expected from analogy with the course of other great forest regions of the country operated of late years under a similar system. In particular, large expansion is expected after a period of about 15 years, following expected shrinkage of volume in the cut of southern yellow pine.

There are, however, special elements in the present case which impose limits on expansion. Of these in respect to inland distribution geographical location is chief. The region, in comparison with the yellow pine industry, and particularly with that of the Lake States of years ago, is at a long distance from the country's central and greatest markets, with a costly freight haul. This raises necessary cost to consumers, lets in substitutes for lumber, and finally influences the habits of the people.

As to the great market for fir lumber between the Cascades and the Missouri River, fears have been felt that the country is already built up, and may in the future require a less volume of lumber. What appears to be the most competent opinion runs, however, to the contrary effect, holding

that further settlement, subdivision of farms, improvements in agriculture, and better building will at least maintain the present volume of demand. Steel and concrete have indeed taken the place of wood largely for bridges and other heavy structures, while in respect to fencing, sidewalks, etc., the use of substitutes has been general all over the country, but for the construction of buildings wood remains yet the desired and available material. Lumbermen will attempt also to increase the volume of use in their natural markets by merchandising pressure as shown under the next heading.

The rate at which local and California demand for lumber may increase depends on the growth of the local communities, a matter for which the lumber industry shares responsibility.

The off-shore trade, both domestic and to U. S. dependencies, has experienced steady growth for many years (exports 1894-6 averaging 130 million; 1903-5, 250 million; 1912-14, 487 million). There seems no reason why further increase should not be had in future, particularly if the trade is systematically cultivated. Ultimately some markets may be cut off by the development of a lumber industry in Manchuria, Mexico, etc., but that seems a long way in the future.

The opening of the Panama route is a matter considered of commanding importance for lumber producers of the fir region. Freight on lumber to Europe will be largely reduced,

and considerable extension in the use of fir products is looked for in that field, but a much greater extension in our own northern East Coast markets. Here, on the seaboard, or within easy reach of it, is a population several times as large as that of the West Coast States, a region the bulk of whose native timber is exhausted, while its forest areas are only gradually getting onto a second growth basis. Thus, in respect to the broad economics of the matter, the advent of Coast lumber through the Canal to the north Atlantic Coast seems timely, and fir operators should profit largely by it.

Gradual accommodation to this market seems most desirable and the volume of trade has as yet been small. It was expected that 200 to 300 million would be sent to the East Coast during the first year the route was open. Owing, however, to slides closing the Canal channel and to high freights brought about by the war, shipments amounted to but 34 millions in 1914 and 86 in the year following, while shipments to Europe experienced but a small increase. Relations with our own East Coast markets are treated specifically later.

The present outlook in regard to expansion, while favorable in a general way and within limits, is also unsettled and dubious, due in part to conditions produced by the war, in part to the competition from various lumber producing regions in supplying domestic consumption. A reasonably

steady expansion, with fairly easy conditions as regards price, would augur best for the industry and region.

The above refers only to the expansion to be looked for within the next few years. The strong position products of the fir region promise to hold in the markets of the country in times more distant is not to be lightly predicted. This will result not only from the fact that of the country's great native forest resources this promises to hold out longest, but also from the high quality and wide range in adaptability of its products.

Merchandising Service

Historical reasons for the low degree of efficiency in this department have already been traced--in the nature of the product, its abundance and low value in times past, in the absorption by lumbermen in their timber investments at the sacrifice of operation, in the conditions of life which lumber production has involved, requiring and creating men rough and ready and efficient in their way, but apt to despise small things, poorly adapted to the finesse of the market and unskilled in the niceties of finance. Need for expansion demands improvement at this point and steps are being taken to provide that. The adjustments involved are taken place earlier and faster in the consuming territory, but to some extent producers as well are joining in the movement. Better

manufacture, more prompt and accurate attention to orders, study of market needs, cultivation of cordial relations with buyers and consumers, truly creative work in showing consumers through plans and skilled advice the most effective use of lumber, are features showing at the present time and likely to greatly increase. The key to such advance, determining its effectiveness and the forms which it will assume, appears to be the idea of Service.

Associated Activities

Effective operation in the field last covered is in large part too much for the individual lumber producer. Some of the activities referred to and others to be developed can best be carried on through associated effort. The development of association work to date has covered the four following fields: lumber grading and inspection; maintenance of the interests of the industry in respect to transportation; credit information and adjustment of claims at a distance; and the collection of statistics on volume and destination of sales, on mill stocks, and on price.

The service rendered by several of these activities is not to be disputed or qualified, and that service is of value to all concerned. One that was not covered in the earlier review, and that as a matter of fact is imperfectly

developed as yet, is the collection of statistics as to volume of production, orders, shipments, and stocks. These enable those who receive them to so conduct their business that losses are avoided and production may go on in intelligent relation to current market conditions, with less risk and at less cost.

The diffusion of information as to the price of lumber sold stands on somewhat different ground. By some, entire publicity as to prices had is recommended as a means of protecting the public against extortion from any industry. Denial of the right to circulate such information among producers, to be acted on by each in accordance with his judgment and interest, would seem to be a hardship, and it would also promote instability and loss. Such action does not restrain, but promotes the soundness and service of trade and industry. While information of this character would doubtless aid joint curtailment of output and price fixing, the latter are different things and would require a different organization. Accurate knowledge of market conditions is one of the essentials of sound individual business, but apparently it can best be obtained cooperatively.

But associated activity has greater possibilities ahead. Not only can the present field of work be covered much more effectively than has yet been done, but new lines of associated endeavor are opening up and in fact have already been entered. Employment by the local association of an engineer to experiment with preservative treatment and develop

markets for treated timber is a case in point, with much promise in it. A related means of bettering realization, and at the same time extending service and promoting the utilization of the natural resource is the marketing of waste or surplus material in other forms than lumber. Future opportunities in this field through the development of paper pulp and chemical industries are undoubtedly large, though it is to be expected that they will open slowly. Research into these possibilities and the exploitation of new products might well have its place among the cooperative enterprises of the industry. The advertising of lumber is another activity which the local association has just undertaken. This again, carries service with it, aiding consumers to buy and use wood intelligently, and there is no indication of its being carried to a point that is excessive.

Organized and recorded knowledge, made common property and obviating the necessity for experiment and trial in every new case, has been almost completely lacking in the lumber industry to date. That arises in part from the nature of the industry itself, in part of late years from its relation to public opinion. Competent, professional mill engineering and scientific handling of logging equipment and organization promise much. Natural business development will do much in these lines; association work is rather likely to promote them as well. Organization and exchange of knowledge in the

whole field of production has in fact large possibilities for developing sounder and better run business.

On the other hand, entire uniformity in all these lines is not to be expected. No two mills can be exactly alike, and in logging every piece of ground presents problems of its own. In respect to lumber products, too, there will always be variation in quality, natural and acquired in manufacture, which grading rules cannot eliminate.

Lumber manufacturers' associations are associated in the minds of many with efforts at price fixing and systematic curtailment of output. That idea indeed is not false to the facts, but it is frequently exaggerated in respect to the success of such efforts and their prevalence at the present time; while the positive and fruitful sides of association work are often minimized or neglected. Since it is true, however, that precisely because of the aspects above mentioned association efforts have not had the cooperation of some producers, while by reason of the desirable and necessary character of some of them all should be listed, the reason is stronger that in future they should be kept within limits of general benefit and undoubted legality. Concentration of the agencies now handling this work in the Douglas fir region is to be expected.

Sounder Business

The loose work characteristic of the period of rapid expansion has been described, with its results evident at the present time in a tremendous range in soundness and efficiency. With this fact recognized, the pressure of necessity, the good sense of the region, and lines of educative or cooperative work must be looked to as the means of remedy. Remedy is desirable not only from the viewpoint of the men immediately concerned, but from every other, including that of the sound and capable concerns; for it is not competition from within their own class that these have to fear so much as from those that are unsound, inexperienced, badly run, or working on other people's money. The small mill has already been treated from this viewpoint, but the trouble is by no means there altogether. Correction in this broad field will go very far toward relieving the troubles of the industry, will even take care of the general interest in the matter of utilization as far as under the play of economic forces that is attainable.

Better technical work, mastery of business processes, is one desideratum. Better accounting also should be a factor, and the local association has already asked the cooperation of public agencies in this field. Financial soundness is another important element, and here a powerful influence might be exerted by the banks. These, through the recent depression,

have come to recognize the importance of the industry to local welfare and to review their own relations to it. Violent reaction from old-time freedom and confidence is the last thing needed here. What is desirable is discriminating, conservative backing, having regard for the interests of the industry as a whole, and the cautious, disinterested guidance which it is the province of financial institutions in older communities to give. This, in view of the circumstances, should involve a degree of cooperation.

Stabilization of the Market

Violent fluctuation of the market has been shown to be characteristic of the region; causes have been traced, and the undesirable results pointed out. There are those in the industry who realize this condition clearly and who wish more than anything else that a degree of stabilization might be brought about. They have had enough of plunging and throat-cutting; they think a great industry is not what it might be and ought to be that is subject to such violent changes; they believe the prosperity of their section of the country should be steadier and more assured. Particularly for the industry itself do they believe its interests in the long run are damaged by the violent ups and downs. Excessive prices and unreasonable expectation of profit they see stimulate overproduction that causes reaction in turn and a crop of failures.

Buyers they know are alienated by the violent fluctuation, driven to other sources of lumber or other materials when available, and the volume of use probably thereby decreased. Labor, they see, with every strong rise in the market comes up with heavy demands, and worse than that a large share of it becomes inefficient and unreliable, of little service either to itself or the industry. These men would like to see their industry readjusted, to have it claim its just dues on the basis of real service and of self-respect, repudiating unreasonable demands on the same ground; and the resulting conditinn they believe should be of vast and diffused benefit to their section of the country. Their own business practice as far as may be is aligned with these ideas.

With all the unsettlement of ideas and the great diversity of forces in the field, particularly at the present time with the world in the throes of war and adjustment yet to be made to new markets made available by the Panama Canal, seriously to look for stability in the fir market for some time to come would be quixotic. For all that, it is an idea to cultivate. Fairly stable lumber prices have been experienced elsewhere - in New England of late years, for instance. The conditions which permit that are more conservative business methods, more stable social conditions in general, and freedom from the pressure of highly capitalized timber. Favoring

local conditions are the desire for greater stability on the part of buyers and distributors of lumber and the fact that production would be cheapened if men, instead of working in large part with reference to the market, could settle down to the steady and economical production of the volume of lumber required. In this last point the public at large is concerned, as likewise in the better utilization of raw material that should follow.

Such stabilization of the market involves several things. On the side of consumers and the public, it involves the recognition of fair and living prices, surrender of the idea that the cheapest price no matter how secured is the best price. A similar idea has long been recognized in connection with wages. The obverse of that again is a similar state of mind on the part of producers. The limit to realization set by economic laws and the special circumstances of the case should be sensed. Thinking men believe that moderate realization only is possible in the long run, levels of price that must be unprofitable to some, that do not hold out heavy inducements to too many producers. Numbers of such men deprecate too high prices.

In the next place there is involved adjustment of production to demand. The latter is bound to vary somewhat, seasonally and otherwise, (it does not vary as much in the

case of lumber as some other staple commodities) and over it producers can exercise no control. Over production they can and should exert some control, unless indeed the law of supply and demand is to be interpreted to the effect that producers shall produce steadily to the limit and take any price that results. Some effect in this field will be exerted through better regulation of stocks as the industry becomes more strongly financed. The dissemination of market information and statistics on sales, production, and stocks, will aid measurably, if producers act on it, in accomplishing the purpose.

With all this there remains operating against the change which is desirable for all collectively the interest of the individual concern or operator. This has been explained, and its force is not to be minimized. Further, as things stand today, many have not control of their own actions. In good times they are under obligation to coin all the profits they can, a factor to be sure which acting through volume exerts finally an equalizing influence. On low prices the weight of interest and taxation, the necessity to realize in order to meet financial obligations, operates to the same purpose. Control should begin with the stronger operators, would proceed with the strengthening of the industry financially, the banks cooperating in ways pointed out in the preceding section.

To summarize: These seems no sufficient reason to doubt that the industry could, if it set out to do so, with the cooperation of the banks, the trade and the public, do much to stabilize prices on fair levels.

Larger Units for Production and Merchandising

As indicated in the section on manufacturing, typical plants in the Douglas fir region run from 100 to 175 M feet in daily capacity. There are numerous smaller plants which are effective in proper conditions when well run, and a few of larger size. There are also several business organizations made up of either two or three mill units. These produce yearly from 100 to 200 millions, while the typical plant first mentioned produces from 25 to 50.

As a manufacturing plant, the typical unit is reasonably economical and effective, and the region has learned to handle it. In the line of merchandising it is not as strong, on account chiefly of the distance of markets and the very wide distribution of the product. However, some competent men believe that outputs of 250 M daily, are sold as effectively as larger outputs, and doubt whether larger volumes will be handled as well.

Nor does the agency system, from experience to date, prove the practical advantage of larger selling units. The poor success of agencies in general resulted from the looseness

of their structure and the individual factors involved, but these are real factors in the situation. Progress must come with utilization of the forces and elements actually existent.

Selling agencies have indeed served their members through keeping them in touch with markets better than they would otherwise have been, and in one case, the grouping of a number of small mills into one selling unit did, by report, work out great advantages. These mills are too small to have effective selling departments, and among them they had a variety of timber and of plant. The testimony is that in this case a man able and forcible enough to dominate, and knowing well the circumstances of each mill, by taking on business of appropriate quantity and character which he distributed to each in accordance with its circumstances, secured for these plants probably $1 per M greater realization than they could have secured alone, and at the same time a far more effective and advantageous utilization of the timber. Such work as that is productive from every viewpoint. The elements of success were strong, able management, and selling coordinated with manufacture.

Probable lines of development in this field of larger scale manufacture and merchandising as they have been apprehended are summarized in the following. Fair consideration takes into account the difference between the independent man working for himself and the hired employee.

1. Small mills now dependent on brokers for selling at a distance, seem especially open to sound development of the agency system or some other form of cooperative marketing.

2. The development of very large wholesaling units on a sound basis looks like a plan of selling in distant fields which the industry would find of service.

3. The standard unit of 100 to 175 M looks like a permanent thing for the manufacture of many bodies of inland timber. Numerous mills of this size today are also handled with considerable effect in the merchandising field, and it seems probable that with some assistance from brokers and agencies that system will largely continue.

4. Of the log-buying mills on tidewater the same thing, in the merchandising field, may be said, and the opportunity for specialization in manufacture which these great assemblages of logs present, these mills take care of in a fairly effective way. It would seem probable, however, that further specialization in manufacture than is now practiced will be put in force in course of time. Cedar is already manufactured in special plants in some cases (lumber and shingle production serving to use up the material very economically); there is room for the extension of that, and for the separation of spruce and hemlock from fir. This specialization might come about through very large organizations for production as well as further development of the log-buying mill.

5. Very large units producing several hundred millions yearly, with a complete merchandising organization and owning shipping, have been advocated in some quarters - complete concerns reaching from the stump to the retail dealer, shipping by both rail and water. To the advantages from specialization of manufacture just pointed out should be added the possible improvement and cheapening brought about by the employment of experts while several units are more readily adjusted than one to variation in demand. In the logging field large-scale, concentrated work and high class management promise similar results. A very wide selling field, it is claimed, would dispose more advantageously of the great variety of products. Savings in cost of distribution are also claimed, while the concentration of interest would afford incentive to push the product. Should these ideas be carried out successfully, the fact probably would also secure in time closer utilization than holds at present.

The fact remaining that any organization of this kind would have to meet competition from men of skill and experience operating plants with which they are thoroughly familiar and of pretty high efficiency when broadly looked at, it is clear that very high-class ability would be necessary to conduct such large-scale and highly organized operations to success. Next is the consideration that such a

project requires more capital than is possessed by most fir operators. There are, however, in the field today, concerns of natural growth which in greater or less degree approach this form of organization. One of that kind in the inland field was mentioned at the end of the discussion of distribution, and several large concerns ship on their own vessels by water to California. A natural field for the same method of operation is the trade via Panama with our own East Coast.

6. In 1911 there was formulated a plan for the combination of about one-half the fir mills located on tidewater, and an examination of this plan will illuminate the matter. The plan failed of realization in part because of question as to its legality, in part because of disagreements as to valuation which come up in every such case and are likely to be especially strong in connection with stumpage, but in part also because of disbelief in its success on the part of some whose cooperation was necessary. The design was to acquire 35 manufacturing plants with a yearly capacity of one and a half billion feet, about half the capacity of the region in tidewater mills and one-fifth of its total capacity. These were largely at Gray's and Willapa Harbors, with some Sound and River plants also. The management of these plants was to remain in the hands of present owners. With them came several logging plants and some timber; two outside logging companies were ready to join; in all 20 years' supply of timber was provided. Sufficient outside capital was to come in to put the concern on an easy basis

financially and to provide additional equipment, shipping and terminal property on our East Coast and elsewhere, the plan embracing in the marine field direct through dealings as far as possible. Expectation of excessive profits was denied and publicity was courted. The core of the plan seems to have been to adjust production to demand and keep prices on a steady and moderately paying basis.

The plan has been criticised in the following points:

a. The timber proposed to be taken on would have made in the early years a very heavy load to carry. As things stand on the Coast in 1915, half the amount designed, taking a fighting chance to purchase the rest as needed, would have made a more promising proposition.

b. In respect to economy, none in the manufacturing field was clearly promised except through financial ease and large scale buying. Logging might well have gained from the large scale work, and the system of direct merchandising is in line with ideas of commercial progress. The advantages expected from the present much discussed export selling combination would have been in the grasp of the proposed company. But it is a tremendous jump from the units which fir operators are accumtomed to conducting to the organization planned; it would have been very widely spread out as well; some are of the opinion that the gap would not have been bridged successfully.

c. The combine was big enough to regulate production in any ordinary time in relation to demand, and so, if its course had been moderate and fair, to maintain prices at a steady level, but it would have had to bear the cost of that process, from which burden its competitors would have held themselves exempt. Of competition there was much left, with the chance to develop more on available timber. It is questionable therefore if in regulating production the combine might not have held the sack for its competitors.

d. To sum up, its critics believed that the bigness of the scheme, while giving some advantages, introduced also elements of weakness. They think the scheme promised advantages to the industry and no extortion for the consumer, but of its success as a business enterprise they are very doubtful.

The development of larger units for production and selling being looked on as probable for this region, not indeed at once and on a vast scale but as a matter of growth (extensive timber holdings also will be involved in some cases), the chances of monopoly and of damage to the public interest through unreasonable prices should be reviewed. Along with that must go the reminder that the public is positively interested in whatever may prove to be efficient and serviceable business organization. The bearing facts are apprehended to be as follows:

a. Reduction in the number of competitors in all fields, reducing the pressure and detailed nature of recent competition, would seem to be really desirable for the industry and indeed for all concerned. On the other hand, fir operators are by makeup so diverse and individualistic that there seems small prospect, even were there no legal obstacles in the way, of getting them or a commanding proportion of them, into one organization, or reducing the number of competitors to a small figure. Great units would have to operate efficiently to live against the competition. The larger organizations promise to be not of one type but diverse.

b. The status of timber ownership (see particularly pages to) is such that withholding timber from use is difficult. A party well informed in this direction has stated the problem of the lumber industry as "the increase not of profit alone, but of market, for either without the other will fail to meet the burdens now carried and certain to increase. Curtailment to maintain profit is a temporary expedient, for it merely defers the reckoning with timber carrying cost."

c. Competition from other lumbering regions, from other countries, and particularly from substitutes is a large factor in the case.

d. Timber publicly owned could be used in case of need to check unreasonable lumber prices.

e. It is a consideration that however elaborately this industry may now organize it must in time revert to a simple form, because economical manufacture of the second growth coming on and expected, which in time will form the bulk of the raw material to be had, requires operation on a small scale.

A fair summarization of the case is that large producing units cautiously worked out seem to promise some increase of efficiency, also to contribute to that stability which has been pointed out as from all viewpoints the chief need of the industry at the present time. Existing checks on such development as would lead to monopolistic control and public damage would seem to be ample.

Summary

This chapter has dealt with a subject which, while it has financial and technical aspects, is in essentials human. Men self-selected for force and the spirit of enterprise, in the pioneer and succeeding stage of this region, built up a regional industry now consisting of some 600 units. Through the period of rapid growth methods were unsettled, standards low, and, for a period that stands in formative relation to the present, profits were easy. Inevitably, great variation in the size, efficiency and financial strength of plants is characteristic. Among the different units, while some interests are common, antagonism is strong and frequent.

Thus situated, the industry in 1913 entered upon a period of slackened demand that lasted for more than two years, low prices resulting, and the pressure developed was too much for many. It reached wide circles and cut harder than most, although they may appreciate certain beneficial results, like to witness. At the time of writing, conditions are greatly improved, however.

Measures the most diverse have been proposed by way of improvement, the wildness of some induced by the tension, This report indicates certain fundamental measures - sounder business financially, improvement in technical efficiency, better effort and organization in marketing. Some forms of industrial cooperation have been shown to be a desirable adjunct, and a measure of cooperation from outside is needed. The sign of improvement will be greater stability in the markets.

These developments will be of benefit not to the operators alone, but to labor, to the surrounding communities, to the consumer. Indeed the whole country has a direct interest through the effect to be had on the conservation of timber.

In present conditions stability looks difficult. Some harmony of purpose on the part of operators is essential, will promote the end sought if that is in line with economic forces. Set against these, however, it promises to fail.

These forces appear to be such that except by the exceptional producer moderate profit only can be expected. No one certainly begrudges that to an essential industry; the widest and best service in fact is promised by that means.

Part IV

Utilization of Resources

Introductory Statement

THE STIGMA OF WASTEFULNESS, THOUGH GENERAL AND ILL-DEFINED, HAS ATTACHED IN RECENT YEARS TO THE LUMBER INDUSTRY IN THE MINDS OF THE PUBLIC, OR A SECTION OF IT. LUMBERMEN, ON THE OTHER HAND, HAVE SOMETIMES CLAIMED THAT THE PUBLIC WAS PROFITING AT THEIR EXPENSE, THROUGH THE PURCHASE OF MATERIAL AT PRICES LESS THAN THE ACTUAL COST OF PRODUCTION. BALANCED AND SETTLED VIEWS, IF THEY CAN BE ARRIVED AT, ARE CLEARLY DESIRABLE.

THE GENERAL CONCLUSION REACHED IS THAT WHILE THE LUMBER INDUSTRY OF THE PACIFIC NORTHWEST CAN NOT BE SAID TO UTILIZE ITS RAW MATERIAL WITH REFINEMENT, THE CHARGE OF GROSS AND GENERAL WASTE WILL NOT HOLD AGAINST IT, WHILE AS FOR WHAT DOES EXIST IT IS HARD TO SEE ANY REMEDY OTHER THAN THAT ARISING THROUGH CHANGE IN ECONOMIC CONDITIONS AND GAIN IN BUSINESS SOUNDNESS AND EFFICIENCY THAT WOULD NOT TAX THE CONSUMER OF FOREST PRODUCTS MORE THAN HE WOULD BE LIKELY TO RELISH.

Principles and Illustrations

This matter as it works out in practice turns on the relation between cost and price. The lumberman utilizes of his timber what pays cost or a little better, and conversely, leaves behind what will not pay. He does, that is, if he looks after

his business in these modern and competitive times. Not every operator is keen in the oversight of his work, and in earlier times and locally the rule has sometimes been to take only what will pay a certain rate of profit, leaving the rest as beneath notice. The last, however, are not now important considerations.

The public is interested in the matter in two ways: first, as participant in interest in the utilities latent in a natural resource (what fails to be utilized in present operation is gone forever and through lessening the supply will have its effect, small or great, on the future price of lumber); second, as present consumer of the products derived from a share of that resource. What the lumberman takes out of the woods and sells the public pays for. One point at issue, therefore, is how well the balanced interests of the public are served by the lumberman's operations.

In May, 1915, at a logging camp in Skagit County, Washington, a body of splendid, serviceable timber was left untouched, though standing between the spurs of a logging railroad, because it would cost all the product was worth to handle it. The operators said they had 15 millions of just such timber standing in the neighborhood. The trees were from 15 to 30 inches in breast diameter, tall, perfectly sound no doubt, but they were largely hemlock, not fir, and they would furnish only common lumber. This at the time would net the mill from $8 to $9 per M, just about the cost when fully reckoned. Had these operators cut that timber on

the existing market, not only would they have got no profit, earned nothing to help them settle with the banks to which they were heavily in debt, but they would have lost whatever they paid for the stumpage.

Ten to eleven dollars per M has been commonly realized of late years for such lumber as these trees would furnish, and occasionally a better price. These men hope for a repetition of such conditions, and what they will do is to continue their present policy of cutting only high grade timber from which a margin over outlay, though it may not be profit, can always be had until the market picks up, in the field particularly of common lumber. Then they will turn their force into this territory and log it out. Having several years' operation ahead on this line of railroad, the probability is that at one time or another they will realize fairly on this body of timber.

Several things are illustrated here, among them (a) the wealth of timber resources in this region and the very low price of serviceable building lumber; (b) the principle followed in the past by the stronger and wiser timber investors, not to start cutting in a country until its main resources have considerable value, is seen to have broad economic utility; (c) the instance shows clearly how utilization is governed, even over short periods, by price.

The real losses of use value that sometimes result from conditions of this kind, may be gathered from the following instance. A few months previous to the above observation a logging company

in the same general region left for good, taking up its rails, about a million feet of small and low grade timber situated in rather a hard place. This timber would have been cut in ordinary times, but in 1914 log prices were low, the market strict in its requirements, and on this particular body of timber the operators believed they would hardly break even if they cut it. This bunch of timber may perhaps be within reach of some other operation at some time in the future; perhaps it will serve a useful purpose in seeding ground, or meet some other contingency not now foreseen; but the chance is fair, on the other hand, that it will be killed by slash fires.

A mill camp in the same region and in somewhat more favorable conditions than the first named, was found at the same date to be leaving stands of young timber with scattering trees as large as two feet across the stump that would yield logs 12 inches in top diameter and 40 feet in length. These stands would cut 50 M feet to the acre if sawed by a New England portable mill, yielding perhaps $250 in stumpage. Where they stood, a concern would not get back its expenditure if it logged them.

Not only the abundance of timber and the low price of lumber determine these matters, but the style of rigging used for logging and in the mill. In both cases these are adapted to handle the large logs that make up the bulk of the cut, and small timber is handled at extra expense. That expense finally, as was shown earlier (see pages and), eats up the value.

The suggestion gained at this point, that ground be logged over a second time, with some lighter equipment adapted to pick up the small pieces, has in fact been acted on widely by West Coast operators in connection with cedar. Shingles may be manufactured from small pieces, and at many points in the region through which cedar is distributed a second crew goes over the ground, cuts up the slivers, shells of trees, and tops into bolts for shingle manufacture, and hauls them out to the railroad with horses. For the same reason, their greater value, cedar logs with a quarter of the contents of any fir log it would pay to handle, may be seen on the log trains, and chunks and slivers that wouldn't sustain a boy's weight above water in the booms at the mills and landings. One concern in the effort to pick up its land more cleanly, tried horse-logging down the old roads to a portable sawmill at the track, but hasn't as yet made a success of it.

Waste in Early Years

In the early days, when timber was very cheap or regarded as common property, only high-class lumber was salable and that at low figures. Men had to take only what they could handle cheapest and sell to advantage, and economy was an idea they could hardly apply at all. Methods too had a share in fixing practice--their mills wouldn't handle the largest logs, and in logging they hadn't the power at command to take timber out of gulches or off broken ground. The ground cut over in those early years is now occupied by new forest or covered with cities and farms, so that,

except for the great stumps in some cases, it is not possible now to get figures directly on what those lumbermen left. By men's accounts, however, one can get approximately at it. One of the prominent loggers of Washington, for instance, a man, however, who in his time has personally performed every operation embraced in logging work, estimates that what with the timber left in gulches and on pinnacles, the windfalls, the stumps cut 8 to 12 feet from the ground, the tops cut off as soon as the knots fairly began to appear, defective logs, the trees too small and those too large to handle profitably, 44 per cent of the timber an operator of today would take was left on the ground, to be destroyed by fires. The fine logs of those days brought at the mills $4 to $6 per M. Now men are pleased when for the output of a camp they get $8 to $9. If the increase in price seems to any regrettable, the compensating fact should not be neglected that, granting the truth of the above estimate, we are now getting one and two-thirds as much timber volume from the same territory.

Governing Factors Vary Locally

While value of product is the big determining factor, several others, referred to in the part on logging, bear on the matter of woods utilization locally.

1. A good percentage of the logs manufactured in the two States is hauled by common carrier railroads at a rate per M feet which is computed on a scale of the logs made by the carriers. This scale more often than not is full, that is to say, the logs

are measured at full size whatever their quality or however large the percentage of rotten wood they contain. This is just in a way, for the cost of haulage to the railway is proportional to weight; but that $1 or $1.50 of extra cost to meet on logs of low value or logs half of whose contents perhaps is worthless, throws down below the paying level a percentage of logs that can be handled at a profit when conditions are otherwise.

2. What a concern will take off the ground depends sometimes on its financial relation to the timber. If this is owned outright, its interest is to take every stick that will pay cost or better, and from total cost men will deduct depreciation on railroad grades and other expenses which are the same whatever the amount of timber accommodated. If, however, they are paying by the thousand cut, as is the case, for instance, with buyers of National Forest timber, the point marking the break between profit and loss comes only when stumpage has been added.

3. The phenomena of the log markets have considerable effect on utilization. A concern delivering to these markets can not figure on what is profitable ideally, but what in its own specific conditions will net some return. Now these log markets have to be run on the basis of rules for the scalers and graders to follow, which business men on their part can depend on.

In respect to size, this shows in the grading rules of the Columbia River log market in which a log 12 inches in top

diameter and 16 feet long is the smallest specified as scaleable. Such a log scales 80 feet, and from well grown timber very few logs of this size are produced. The waste is not great, therefore; still a company hauling to its own mill may in favorable conditions haul in even smaller timber. Much the same rule applies to such as carry defect.

As a matter of fact, there is in the log markets a good deal of accommodation, both one way and the other, regardless of rules laid down. This seems to be working satisfactorily in a business way, and waste of material may be thus avoided. In special conditions, however, market advantage lying with one party or the other, an appreciable effect on utilization may be caused through this form of organization.

Late in 1915, for instance, on the Columbia River, the logging industry as a whole running at low capacity and being under heavy expense for idle plant, certain buyers of hemlock logs in drawing contracts for new purchases raised the size limit. Action of that kind carried beyond a certain point materially affects the work of the camp, imposing heavier logging cost because of less cut per acre, causing loss of profit on volume and of stumpage paid. Also, from some stands, under the new rule a considerable percentage less timber will be got off the ground. In another case, however, the interest of the strong party in the transaction might lead to closer utilization.

1906-1907

In 1906 and 1907, there was probably closer utilization in the Douglas fir woods than has taken place either before or since, and with close observation the results may be seen yet. In one case the difference was estimated at around five per cent, but that would vary much with conditions. Defective, stained or partly rotten logs were a large factor. Such logs sold in those years as high as $9 per M, yielding handsome profit, that at no time since have sold for anything like that price--logs, in fact, that are not intentionally handled in ordinary times. Conditions of that period, however, were not on a firm economic basis and could not last. The mills were running at high pressure, getting high prices for their product, and any kind of a log that would make lumber was taken. The logging plant of the region was strained to the limit to keep up with demand, and one way to make it produce more was from each railroad spur and donkey setting to pick up every log that could be sold; the timber was picked up as it never had been before,-and consumers paid a good price for a low class of lumber.

Business Development Promoting Close Utilization

The above was a temporary condition, unstable, probably undesirable as a whole. On the other hand normal advance in price has been indicated as the big factor which brings in closer utilization. But there are several others that are powerful, arising from the development of the industry in a general way. One that

has been operative for some years past is the matter of log grading. The main purpose of this arrangement was probably to facilitate business transactions, but it works for better utilization of timber as well.

Through all the early years of the industry logs were sold camp run. The practice indeed is not entirely eliminated today, but a steadily increasing proportion, the greater part for 10 years past, has been sold on grade. This facilitates the utilization of small, rough, and partially defective timber. Under the old plan there was constant pressure from the buyer to keep out of the scale logs that were not worth the average price. Under the new system the low grade log comes in on its merits, at a suitable price, and there is less of such difficulty. To prove on the ground the effect of this business practice would be a tedious matter, but testimony and judgment both run to the effect that its introduction has caused utilization of large quantities of timber that formerly went to waste.

2. A second matter that has helped is related to the last and consists in professional, disinterested log scaling. Years ago the mills scaled the logs they bought, or certain men who had a reputation for competence did it. Not only did that system give rise to bickering and law suits, but the unreliability of the work rendered the logger uncertain as to what he could get paid for, and caution was his only safeguard. With a dependable scaling system at work, he can haul out his low grade stuff with far more confidence.

3. Even the greater variety of logging equipment available at the present day helps on this score as well as with cost. The usual type of logging, with ground machines, has been taken for granted in all previous discussion. The rigs using suspended wire now being introduced on a considerable scale, particularly in mountainous areas, change relations a good deal. Good logs may be picked out of a mass of rotten ones much more easily with them, and the difficulty of operating on broken land is lessened, allowing cleaner work to be done. The saving in timber as well as in cost is, in fact, in conditions which suit them, one argument for their introduction.

4. More generally and on a larger scale, economy has been gained in the mills of late years through change in the form of lumber demanded by the market. Formerly large dimensions cut to order formed a large share of the output and their production meant waste in both lengthwise and cross cutting. Small dimensions at the present time form the bulk of the output and can be produced with greater economy of timber.

5. In respect to one ideal not yet largely attained, the utilization of sawdust, bark, edgings, etc., through distillation or for fuel to produce power and light, the chief factors in the situation are clear--lack of sufficient local population to consume the output, and competition from water power. Similarly the large amount of material left on the ground in logging awaits fundamental conditions necessary to economic use. In other words,

we have still in this country cheaper and easier ways of supplying ourselves with the things indicated.

Thus in various ways the development of the country as it progresses and the natural movements of business broadly, though it may not be exactly or quickly, work to promote the closer utilization of this timber. These results, too, are secured through natural economic forces--as far as the public is concerned, they come without effort.

Effect of Competition

In the discussion thus far intelligent, reasoned practice has been had in view. It is not implied, however, that all practice is careful or based on a correct knowledge or interpretation of the facts. But this is true--that serious departure from sound standards, at this point as at others, unless circumstances are otherwise exceptionally favorable, causes elimination of the operator who lags behind. This force, however, works in both directions. The man who practices overrefinement feels it as much as the man who wastes.

The power of business competition to promote good utilization of the timber resource is well illustrated by the following incident:

In April, 1913, a tract of accessible and high quality timber on the lower Columbia River, cruised by a responsible neutral party at 11,504 M feet of "good and merchantable timber," was purchased for $30,000. A railroad spur was built into it and logging at once began. In July, 1913, the operator having

failed to make agreed payments to the seller of the timber, the latter sought to have further sales of logs enjoined and to foreclose a mortgage which he held. In the trial before the Federal Court at Tacoma it came out that the operator had cut 8¼ millions of timber up to the date named and that 330 M by general estimate remained in a body as yet untouched. For the balance between the cut and the estimate, competent and unprejudiced men testified that it was left on the area cut over either standing or down, in forms which the operator should have taken off merely to serve his own interest. The log market during the time was good. As a result of the trial the Court ordered that the mortgage be foreclosed.

Amount of Waste in the Woods

In the effort to ascertain the general standard of utilization among fir camps and the actual amount of waste going on, a careful and experienced member of the Forest Service spent six weeks in the spring of 1915 in making a detailed study at 23 camps. These were mainly in Washington, were taken at random, and represented in considerable numbers both concerns cutting for the log market and mill camps. The results are as follows:

1. Breakage. This was studied in detail at three camps, in timber ranging from 2½ to 6 feet in diameter across the stump, standing in favorable conditions in respect to smooth ground. The work was done after the logs were bucked and previous to yarding. The timber of the second camp had been killed by fire in 1914, and

was consequently somewhat brittle and deprived of the falling resistance of the green top; the fallers' work was, however, carefully inspected in order to keep breakage at a minimum.

Actual utilization is compared in the following tabulation with a theoretical possible utilization up to 10 inches in diameter inside bark:

	Camp A 80 trees	Camp B 40 trees	Camp C 20 trees
Average length of trees stump to 10" d.i.b.,	174'	205'	201'
Average length lost by breakage,	52	74	68
" contents B.M. to 10" d.i.b.,	4,370	6,350	7,640
" " of logs actually obtained,	3,760	5,480	6,740
Proportion of contents lost,	14%	13.6%	11.9%

Collateral to the statistical figures the examiner has to say:

"Breakage is very much greater than above in rough country and occasionally runs up to 50%.

"Large timber breaks up more than small timber; there is little or no breakage in second growth.

"As to what percentage of the breakage is suitable for lumber it is hard to say. In the largest timber we might say nothing is merchantable; first, because the pieces are too short to handle, or rather because it is impossible to cut short logs in a Coast mill; second, the lumber would be all knots, and therefore would be graded as No. 3 common."

2. In General on Clean Logging. The examiner in his report on the work of 23 camps first defines his terms, stating (a) that the subject is treated from a present day Pacific Coast standpoint and not from an eastern or German point of view; (b) that logs used for fuel in the operation and in the construction of landings are not counted as waste. Fuel the logger must have, and specific conditions determine whether logs or oil are cheapest, and what kind of logs. Logs used in landings are often of low quality, they are often taken out at the close of operation, and the aggregate use of timber in this form is estimated at only 1 per cent of the cut; (c) logs of smaller size than 10" in top diameter and 16 feet in length were not reckoned as waste, nor trees smaller than about 16 inches in breast diameter as a general rule, although smaller trees were frequently cut; (d) breakage was not reckoned as waste.

The waste scored consisted of the following items: in Douglas fir, logs larger than 10" x 16', logs of considerable size that were at least one-half sound, and scattering trees or logs overlooked; in cedar, all material suitable for shingle bolts regardless of size; in hemlock, logs or trees left that are ordinaril utilized for lumber--short, scrubby and defective trees not included; in all species, waste in high stumps or other evident bad practice; Finding the work of two camps, with low logging cost, well managed and operated direct to mills, very economical indeed, the work of these camps was taken as a standard of comparison.

Of it the examiner writes "It is believed that no cleaner logging will be done whether lumber prices rise or not." "There was absolutely no waste here from any standpoint."

Taking this standard involves charging up against other camps, selling in the log markets and with higher operating cost, what in the economic sense is not waste to them. On the other hand, adoption of this rule perhaps gives a more useful view of conditions in the industry as a whole.

On the foregoing basis the broad results were as follows:

Fourteen camps cutting for mills owned by the same concerns, exhibiting among them a wide range of logging conditions and of cost, showed a waste of 2½ per cent of their available timber, as above defined. The largest waste recorded is five per cent, and four of the number were charged with no waste at all.

Nine camps selling in the log market (logging cost would run heavier than for the other group) showed, as thus reckoned with, a waste of 7.6 per cent on the average of their available timber; the smallest 2 per cent, the largest 17 per cent.* A wide range of conditions was included among these operators, but the examiner was convinced that with some of them work was done that was not up to the correct standard, viewed from the standpoint of the operator himself.

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*Of this woods waste a large share is hemlock. When lumber of that species is appreciated as from its intrinsic utility it should be, much will have been gained for utilization. This matter is chiefly up to consumers and the merchandising branch of the industry.

In one of the representative mill camps it was estimated that 1,500 to 2,000 feet per acre board measure that might be cut at a profit in New England or the Lake States, was left on the ground. In one of the logger's camps cutting a body of small second growth timber, it was estimated that 3 to 4 M feet on the average of such material was left. On sample areas at this camp 4 M feet per acre of smooth tops 6" in diameter and upwards and 10 to 16 feet long were scaled up, and 5,300 feet at another camp in like conditions. These last are exceptional cases, however, the only two camps that cut any considerable amount of small timber.

On the whole, the showing is a good one. The examiner, writing from long familiarity as well as this special experience, says "The lumbermen on this Coast at the present time, as a whole, are trying to cut the timber on their lands as close as possible. The utilization has been improved year by year since logging first commenced here 40 years ago."

Relation to Log Prices

The above notes, and indeed most of the observations made in this report, relate to a period of depression in the industry, marked by low prices for logs and for lumber. A good many men are convinced that utilization at this time is closer than really pays them. They have, however, worked their crews up to certain standards at great labor and pains; they expect the market to return to a satisfactory level; and they had rather err on this side than the other. For the most part, therefore, the level of woods utilization that had been reached in 1912 and 1913

as the result of long and steady effort has not been lowered by those who were free to choose. There are, however, exceptions to that rule.

There is no doubt, however, that utilization depends on price, and fortunately a degree of utilization which, all things considered, may be looked on as reasonably good depends on only a moderate price. Logging to the great log markets has been shown to average in cost about $5.75, and deducting towage, depreciation and certain other charges which an operator will neglect in figuring on the question of utilization, may be set at about $4.50. With No. 3 logs at $6, therefore, there is an inducement, except where a large stumpage per M cut is paid, to log clean. Similar relations hold for mill camps, a matter which is treated later.

Mill Utilization

The effort to treat mill utilization on a rational basis involves again consideration of detailed cost. The cost of constituent processes as far as they concern utilization of small sizes and low grades may be given approximately as follows:

Sawing	$2.00
Sanding through circuit of resaws	.75
To yard, piling and back to car	1.00
Surfacing boards	.50
Loading on cars	.40
Unavoidable overhead and selling expense about	.50
Interest, taxes and insurance for about two months	2.[illegible]

Against the odds and ends of a mill cut, the salvage from small pieces and very low grade stock, thinking men do not charge the cost of sawing. Sawing has to be done to produce the good lumber and the good lumber should be charged with it, although, because of the exigencies of accounting, it is commonly otherwise.

The utilization of low grades commonly takes the lumber behind the saws, and the question for any given piece or quality of material is what then to do with it. There is always the burner, employment of which saves any further cost. There may be opportunity to work the stock into laths, pickets or profitable fuel. The present question is of its use as lumber.

That may involve in the first place running the piece through a circuit of resaws, to split, edge or cross-cut it, or subject it to all those processes. The cost of that operation has been set at $0.75 per M on the product. Ordinary material will next have to be transported to the yard, piled, and after some weeks of drying taken down and brought back to the point of shipment. For most purposes it also will have to be surfaced. Then it will have to be loaded into cars. Some small selling and overhead expenses are bound to be incurred, although that, like the sawing, should be mainly charged against standard products. Taxes, insurance and interest cost a small sum additional.

Small pieces and rejects may indeed be picked up as the off-fall in any part of the manufacturing process, perhaps as

trimmings in the planing mill, already dried and surfaced, requiring therefore very slight added expense to market them. For such products mills are always anxious for a market at anything above cost. In fact, a number of mills in western Oregon and Washington do sell material so small that it goes by weight rather than survey, the stock being used in eastern factories. Some also work up odds and ends of good stock into small special products. That others do neither is in part no doubt the result of sluggishness, but situation, size of plant, and the kind of lumber being produced as a main line have much to do with it too.

A considerable bulk of lumber, however (short pieces, very knotty stock, such as is affected by decay; if it finds the market at all will reach it by the route earlier outlined, and the cost of that is in the neighborhood of $3.00 per M. Much small, low-grade material has in past years been sold from this region at about that figure, and more has always been available than was ever taken.

As for the general degree of economy reached in sawmills, the following results of a study made by the Forest Service in 1912 on the log utilization of two representative Columbia River plants are pertinent. The upshot is that almost exactly two-thirds of the volume of the log without bark finds its way into lumber (subject again to loss in finishing), while of the remaining one-third just about half goes into sawdust and half into mill waste. Practically speaking, this result seems satisfactory.

Should further plant specialization ever appear practicable, or science devise methods of producing lumber from the log more economical than those in current use, producers will be ready enough to adopt them.

LUMBER, SAWDUST AND WOOD WASTE IN LOGS WEIGHT-TWO POUNDS PER FOOT LOGS

Band Mill

Diam. Inches	Lumber produced	Contents in Cubic Feet and Per Cent			
		Lumber	Sawdust	Wood Waste	Total
44	3,250 feet	270.7 71.5%	54.7 14.4%	53.6 14.1%	379.0 100%
28	1,335 "	109.4 67.8%	27.0 16.7%	25.0 15.5%	161.4 100%
20	730 "	60.9 67.4%	11.0 12.2%	18.4 20.4%	90.3 100%
Avg.	1,781 "	147.0 69.9%	30.9 14.7%	32.3 15.4%	210.2 100%

Circular Mill

Diam. Inches	Lumber produced	Contents in Cubic Feet and Per Cent			
		Lumber	Sawdust	Wood Waste	Total
44	3,114 feet	259.5 68.5%	81.0 21.4%	38.5 10.1%	379.0 100%
28	1,213 "	101.0 62.6%	37.5 23.2%	22.9 14.2%	161.4 100%
20	638 "	53.2 58.9%	19.0 21.0%	18.1 20.1%	90.3 100%
Avg.	1,655 "	137.9 65.6%	45.8 21.8%	26.5 12.6%	210.2 100%

Note:--Logs sawed into 1" and 2" lumber--20-30% and 70-80%, respectively.

Taper 4" on the 28" and 44" logs and 3" on the 20" logs.

Band headsaw 3/16" kerf; circular headsaw 13/32" kerf; edger 13/32" kerf; resaw 1/8" kerf.

Relation to Lumber Prices

Combining the economics of milling and logging, another figure is obtained, of importance from the point of view of utilization. Several mills at various points have to contend with large quantities of defective timber. This comes out in the shape of partly rotten logs that may indeed contain a share of high quality material but which, as was shown earlier, cost as much to handle, in both mill and woods, as logs that are entirely sound. A considerable share of the defective material, however, is only stained or beginning to decay, capable in the form of lumber of serving many cheap and temporary uses. This in considerable quantity the market absorbs readily when better lumber costs enough to make the difference in price an object to the buyer. With good common selling as low as it has been for the past two years, less of this lowest grade has been sold.

With all the mixture of conditions, varying logging cost, different quality in the same log, variation in other telling factors, the problem suggested can not be figured out to refinement. This much can be said with confidence, however,--that when common lumber going inland has brought $10 or $11 considerable sales have been made from fir mills of the very knotty, stained, partially rotten lumber that has been referred to at $6 or $7, that on lower markets less has been sold, and that, at a few points at least, the result has been felt in the logging.

A large Oregon concern, for instance, operating in timber that runs heavy to defect, changes its orders to camp foremen with changes in the market. With the market low, they are very careful about the class of logs they haul. On better markets, with this low grade of lumber selling freely at $6 or upwards, they haul in many more logs from the same ground, in fact utilize as closely, they believe, as they could unless there were a heavy rise in the price of lumber. The quantity involved they have found by tests satisfactory to themselves is 7 per cent of the stand in the territory. Since all trees, promising or not, are felled anyway and bucked up until the loggers are certain they will leave no useful log on the ground, the current cost of yarding, loading and hauling chargeable against the debatable logs is only $2.50 per M. To that is added a manufacturing and selling cost of $3.50. Six dollars for the lumber is therefore the breaking point.

Conclusions

It can not be said that the native timber of the Northwest is being utilized to a point of refinement. Twenty per cent of the material available above the stumps, half of which might be salvaged as lumber by more costly but still practicable methods, looks like a reasonable estimate of the loss in woods operations, and it may be that 35 per cent of the wood volume brought to mill does not reach use in the form of either long or short lumber. That leaves close to 50 per cent of net volume reaching the primary

use, with a minor percentage of the other half used as a by-product. On something like this showing the lumber industry has frequently been contrasted to its disadvantage with some more highly organized industries, and in fact its dispersed and competitive organization has a good deal to do with the matter. That, however, is bound up largely with natural conditions. Further, if in any large degree organization should ever be centralized, the question of advantage or disadvantage would turn not on one but a number of considerations.

Another suggestion has been made occasionally--that the lumber industry of the Pacific Northwest has developed ahead of its time economically speaking. The reflection clears some matters, (high freight cost and small home population, with their effect on utilization), but the fact can not be changed, and advantages as well as disadvantages go with our free, individualistic system.

As things go, then, economic forces govern--the balance between cost and price. This method of regulation is habitual with us; as already shown, it works automatically through individual interest; substitution of another is not easy to conceive of; it would not be a simple matter to show that on the whole the public interest could be served better. That granted, utilization becomes a matter of business efficiency, the problems involved, if a strict mathematical standard is set up, being very complicated. Such problems are seldom worked out on that basis at the present time; that was not attempted in the present work; indeed, the statistical basis of such a task would involve great expenditure.

Approximate results are, however, trustworthy within limits, and they should, particularly if found to be reassuring and harmonious with conclusions from other directions, be of distinct service. And that, as a matter of fact, is the case here. A charge of enormous needless waste can not be maintained; economic forces and the movements which represent the normal development of business are working to improve standards; an industry for the most part alert and active, in following its own interest, is protecting what look like the reasonable interests of the public. The community of interest becomes clearer when the fact is realized that the price levels, for logs and for lumber, that are necessary to such utilization are moderate prices.

Nor does the community of interest end there. Greater stability of the market is in another section depicted as a chief desideratum, enabling men to operate to better advantage, pay better wages, be more secure in their fortunes, build up a sounder prosperity for the region in which they live. The same stability would help them also to so conduct their operations in mill and woods as to get more out of the resource than they possibly can when the market is subject to violent fluctuation.

PART V. EXTERNAL NEEDS

Section 1. Relations with British Columbia

On Vancouver Island and the islands and mainland opposite the greater part of its length, the Province of British Columbia has a timber resource somewhat similar to that of Oregon and Washington. The mainland timber bodies are not vast and continuous, owing to the mountainous nature of the country, and north of the Island the mountains reach to the coast. The extent of the resource is, therefore, much smaller than that south of the boundary.

The interior of the province has great areas of serviceable timber, but in stand, quality, and availability far inferior to the timber of the coast, just beginning to be made available to the prairie provinces through the three transcontinental railway lines. This supply in the main is best looked on as a continental reserve, and the same view will apply to much of the coast timber.

The timber resources of the province are only partially explored. Recorded guesses set the total stand at 400 billions, and the stand of timber that is comparable with Washington timber now being cut at 80 billion feet.

The population of the province is about 540,000. A manufacturing industry with capacity of about 2½ billions yearly, with logging plant to match, has been built up on the sheltered waters of the lower end of the island and about Vancouver and north. Operating facilities are in general good, and in particular the mills are favorably situated for water shipment. The early mills were built for local and export trade, but heavy demand for lumber from the prairie provinces during the years 1905 to 1912 caused a great extension of capacity and a diversion of interest from exports. Inland demand, however, fell off very heavily with collapse of boom conditions in the year 1913, and the mills have been of late in strong need of new markets. A shingle industry with annual capacity of about 1½ billions is in existence in the year 1915.

Only a minor portion of the timberland of British Columbia is owned outright by the lumbermen who may operate it. Title to the greater part is held by the Government and operated under various forms of permit, of which the "license," so-called, covers the greater portion. Under this system the licensee has a permanent right to cut the timber on the area licensed, paying $140 per square mile yearly to the Government and stumpage of 85 and 50 cents per M according to quality on logs as cut. Licenses when first issued are auctioned to the highest bidder; they are transferable also,

and may change hands at a considerable rate. The amount and the incidence of these charges are such that stumpage in British Columbia is materially cheaper than south of the international boundary. The government of the province, deriving its revenues largely from this source, is directly interested in the volume of the lumber industry.

Available information runs to the effect that while logging conditions vary much, the cost of producing lumber in British Columbia is somewhat more than the cost of production in Oregon and Washington, labor conditions, cost of machinery, and other elements entering into that. Producers in the two States feel, therefore, that they can meet competition from the province if otherwise on terms of equality.

Such equality in fact is had in foreign markets, for in respect to trans-Pacific shipments, lumber producers on both sides of the line are free to charter the ships of any nation to carry their products. In respect to shipments to United States ports the case stands differently. Our laws require that vessels to carry cargo between United States ports must be of American registry, and impose further restrictions as to nationality of officers, a common language, and the feeding and treatment of crews. Further, with these advantages to build on, labor unionism has largely obtained control over the wages of seamen. British shipping and that of other nations is subject to far less limitation of this kind.

British Columbia lumber (shingles are not here considered) comes across the line by rail in very limited amounts only, somewhat more extensively since the recent depression set in. Transfer of one shipping office from San Francisco to Vancouver, by changing convenient trade relations, in 1915 deprived one or two Puget Sound mills of desirable and established Asiatic trade. In California, whose markets are largely reached by water, competition with lumber from Oregon and Washington has not been seriously felt because of the close business relations between the two parts of our own coast. With the opening of the Panama Canal, however, relations were established which seriously threaten the interests of producers of fir lumber. The advantage which their competitors have in respect to shipping to the Atlantic Coast has been frequently and competently reckoned at $2.50 per M.

As things stood in the year 1913, this disadvantage was compensated. There was at that time a tariff of $1.25 per M feet on imports of lumber, and in addition the prospect that American vessels would pass free through the canal while all others were subject to tolls calculated to amount to the same figure per M. The disadvantage in respect to shipping was thus just about equalized. But, one after the other, these means of protection were obliterated by legislation, imposing on the industry in the United States a disability

which it strongly feels. It has not as yet had serious effects because of stoppage of the canal channel, the high rates and scarcity of shipping of any kind, and the fact that the Province, though realizing its opportunity, by reason of war and other conditions, found itself unprepared to take advantage of it.

Of late the prospect of competition from this source appears the more serious since the British Columbia government, with its own revenues involved and in the effort to build up the prosperity of the Province's chief industry, has organized a campaign to promote foreign trade and plans through the extension of credit to promote the building of a fleet of vessels, to be owned by producers, for the purpose of lumber carriage.

Section 2. Combination for Selling in the Export Trade

The organization under which "Oregon pine" was introduced to the foreign world was briefly described on page ___. Under this organization masts and spars were supplied to the east coast of this country and trade connections made with the Pacific Islands, with the chief ports on the west coast of South America, with Australia and the Orient, with South Africa and Europe.

This trade in its early years was a matter of individual enterprise, and the Puget Sound concerns that started it, through their trade connections and ownership of shipping,

long maintained leadership. Other mills and independent shipping firms, however, gradually broke in so that in the early 90's the trade had become large and dispersed, and a common standard of grading and inspection was recognized as a business necessity. To meet this need the Pacific Lumber Inspection Bureau was organized. This agency for many years had to overcome opposition and lack of confidence, but at present its certificates settle matters of quantity and grade in nearly all export shipments. With a manager at Seattle and seven district offices, including one at Vancouver, its services are conveniently rendered. It is a corporation organized by manufacturers in which any mill may gain membership by purchase of one share of stock and payment of a small fee. It is then entitled to have its shipments inspected at a fixed rate per M plus the expenses of the inspector.

Another change in the form of the business has been marked of late years. With increasing volume and competition, and the shrinkage in relative importance of the individual concern, the mill firms have ceased for the most part to deal with the foreign buyer direct and the business is handled through brokers. These are some 15 in number; one-third are representatives of foreign buyers or governments; the balance are large brokerage firms, the majority heavily interested in shipping, while a few own interest in fir

mills. Head offices are usually in San Francisco; a branch office in one or another of the northern ports or a local brokerage firm is the medium of dealing with the mills. Usual business procedure is to take orders for lumber abroad, engage shipping, and place the order with a mill or mills, the lumber to be ready for loading at a date appointed or supplied without demurrage. In the circumstances this is a business largely in futures, involving speculative features. As far as concerns Australia, England, and the ports of South America, business is usually arranged for six months ahead.

Against some 15 buyers of lumber for this trade, and these strong and well financed, the producers are some 70 in number, and of late years they have in the main been weak and hungry for business. Further than that, it is clear that producers are put under disadvantage by the system. The broker is interested in the margin between the price for buying and that for selling. Taking orders in the final market on price levels established by competition, his next task is, in his own interest, to procure the lumber as cheaply as he can. Thus two levels of competition press on the individual mill, in fact a third frequently through the process of subletting.

A further result of this condition is great softness of the market and variability in market price. The price

base for export since early in the year 1913 down to date has varied all the way from $14 to $7.50 per M, nearly 50 per cent of the larger sum. Such variability creates unfavorable conditions in any market, and damages the prospects of the trade.

A second disability of producers is the fact that while the broker, who represents the industry in its markets, has some interest in volume of trade, he is not thoroughly informed about conditions of production, nor has he the vital interest in volume and nature of demand, and possible extension of the use of lumber in foreign parts that the producer has. Extensive, intelligent market development is not usually reached under that system.

The facts of the case are in general in line with the above idea. The government of Australia indeed is ably represented in the region; one minor foreign market is represented by a large, progressive concern with an effective merchandising organization in the distributing field; otherwise the business appears not to be pushed actively and intelligently.

For two years past a movement has been on foot for a combination of producers of fir lumber for the purpose of export selling and the pushing of fir lumber in foreign markets. The plan is to take into a stock company (The

Douglas Fir Sales and Exploitation Company) all the mills that will join, to acquire some shipping, to establish offices in foreign markets, to work for market extension in the foreign field, and to take on business which will be assigned to the mills by a central office. The plan aims at a complete combination, and the idea of letting into it not only at the start but later any who wish to join is a feature. The plan is now in abeyance, and aside from the matter of its legality the following difficulties stand in its way:

a. Some large producers do not believe in the principle of combination and are also reasonably well satisfied with their present trade relations. They do not think a combination would hurt them, but will themselves have nothing to do with it. However, some who would not trust to others the sale of their lumber would contribute to a cooperative fund for advertisement and exploitation.

b. When the economics of lumber production is understood (the points are too numerous to be recounted here) enormous difficulties are seen to lie in the way of a satisfactory distribution of business. Even with the utmost intent to be fair on the part of the management, dissatisfaction could hardly be avoided; the size and dispersal of the combination proposed makes the work vastly more difficult than it would be for a few neighboring mills.

Following, from statistics of the Treasury Department, are average prices at which fir lumber (boards, plank, and scantling) has been exported in recent fiscal years. The prices are the values on wharf at ship's tackle:

1909	$12.29	1912	$12.31
1910	12.55	1913	13.11
1911	12.99	1914	12.85

Section 3. Public Timber Policy

Throughout this report the burden of timber holding has been referred to. It has, indeed, been developed as the big, fundamental fact with results outcropping in every direction, even behind the movement for exploitation in foreign lands. In expectation of realizing on this timber the region capitalized it fairly high; corresponding cost, for taxes, protection, and interest go along with that; and events having taken shape differently than expected, the burden is now strongly felt.

Less pressure to capitalize stumpage would have obviated this. The fact might be illustrated from the history of the New England States whose timberland values have had gradual growth, where, also, because of a productive industry profitable and of liberal volume, holding charges at all stages were easily borne. This last is a history matching the slow growth and moderate temper of the East. The other is born of the impatient western spirit. In connection with its disadvantages, the compensations of the

newer system must not be neglected. The force of financial interest and of intelligence brought to bear works out results not attained under the other course; effective fire protection, for instance, has been secured much earlier relatively than in the East, so that a far larger proportion of the native timber stock promises at one time or another to be used by mankind.

With this fact clearly recognized, adjustments which can not be compassed by the industry but involve public action or sentiment are as follows:

The greater part of the publicly owned timber in the region is within the National Forests. Here timber of great potential utility, but of such quality and location that natural demand for most of it will arise only after a term of years, is being held as a public resource and at public cost. At a cost for protection alone (aside from expense incident to use) that may be reckoned as low as $100,000 yearly, 25 years' supply for the industry of to-day, together with the producing power represented by 4,000,000 acres of growing land, is being held in storage against the time when it shall be required for use. So held, it does not add to the burden of the industry, nor is interest on capitalization mounting up on anyone.

The industry in general realizes these relations and in view of them, also because of the condition of overproduction which has held for some years, and of the community

disadvantages which depressed conditions produce, it feels that this timber should not be pressed to sale, even if for a time some excess of outlay for protection over receipts is involved. To sales of timber for local use, the sale of bodies of moderate size approached in the natural course of going operations or which become necessary to the logical development of the industry in particular localities, no objection is entered; it is recognized in fact that economic loss would result from withholding such. On some intermediate conditions there will be difference of opinion; but to the general starting of new enterprises on public timber to be put into the general market, this being as it has in the recent past, real objection is entered. In this connection the western country is viewed as a whole.

Earlier in this work advantages accruing to the public from a conservative sale policy have been referred to - the likelihood of higher realization in the future than would be possible at the present time and possible use of public timber as a check upon unreasonable lumber prices, though necessity for that seems now remote. These considerations apply to National Forest timber, to that on Indian reservations, and in some degree to timber owned by the States. Objection to limiting sales from National Forests comes frequently from the communities whose revenues are affected. Return to local communities of 35 per cent

of gross revenues of all kinds from National Forests partially answers that. There remains otherwise the advantage derived from an industry prosperous rather than depressed, more able itself to meet a tax.

These matters, with other interests of the public to which the administration of the National Forests must be adjusted, are covered in another publication.*

There has passed to private ownership in the past, through railway grants and otherwise, land of such character (rocky, distant, and lightly timbered) that if the public is ready for the measure it can be reacquired for an extremely low price. While the commercial value of such land may be small today, much of it has great producing capacity, along with actual timber resource, and its acquisition in solid blocks would be very much worth while.

A desire on the part of certain members of the industry that the States acquire cut-over lands better suited to timber production than to anything else, was referred to on page . Many in the industry would be ready to exchange cut-over lands for timber, a measure which could be used to solidify State ownership or that of the National Government were the authorities free to enter on such a course.

By recession for noncompliance with its conditions, the land grant of the Southern Pacific Railway, some

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* Forest Conservation and the Lumber Industry by A. B. Greeley.

2,300,000 acres in area, is returning into public ownership. The interest of the lumber industry, and of the public as far as that is embodied in its prosperity and in the conservation of forest resources, runs to the effect that the timbered portions should not be put on the market at once, but be held uncapitalized until the industry is in shape to carry the load, or parts of it are required for use. Running contrary to this idea is the interest of the local communities in respect to taxation. Other ways than the habitual one to raise this revenue may be devised; it is, moreover, questionable if, should these lands with their 50 billion feet be added to the amount now carried by the industry, the revenue-raising capacity of the whole would be any greater than it is today. Western Oregon has in private ownership about 150 years' supply at the present rate of cut of its camps and mills. Its aggregate value is, therefore, speculative, maintained by expectation of realization in times far distant. The addition of 50 billions more might even decrease that aggregate valuation.

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